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THE

Mariner's Compaſs.

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BOOKS of Navigation, Sea Charts, &c. Printed for J. MOUNT, T. PAGE, and W. MOUNT, on *Tower-hill*.

GREAT Britain's Coasting Pilot, by Capt. Greenville Collins.
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N.B. There are also sold all Sorts of Mathematical Instruments and Books, Sea Charts for all Parts of the known World, Plane and Mercators Paper, Paper-Books, and other Stationary Wares.

THE

Mariner's Compaſs

RECTIFIED.

Containing TABLES, ſhewing the true Hour of the Day, the Sun being upon any Point of the Compaſs: With the true Time of the Riſing and Setting of the Sun and Stars, and the Points of the Compaſs upon which they riſe and ſet: With Tables of Amplitudes. Which Tables of Sun-dials, Semidiurnal Arches and Amplitudes are calculated from the Equator to 60 Degrees of Latitude, either North or South.

With the Deſcription and Uſe of thoſe Inſtruments moſt in Practice in the ART of NAVIGATION.

ALSO

A TABLE of LATITUDE and LONGITUDES of PLACES.

By ANDREW WAKELY, Mathematician.

Enlarged with many uſeful Additions, by J. Atkinſon.

The Whole reviſed, and carefully corrected, with accurate TABLES of the Sun's Declination, adjuſted to the N.S.

By W. MOUNTAINE, Mathematical Examiner to the Hon. Corporation of Trinity-Houſe of Deptford, and F.R.S.

LONDON: PRINTED

For J. MOUNT, T. PAGE, W. MOUNT, and T. PAGE, on Tower-hill; Where may be had all Sorts of Sea-Books, 1780.

TO THE

READER.

Courteous Reader,

WHEN I first entered upon these my Labours, and after I had begun the Calculations, I found that though the Book would be small, yet my Labour was so great that I almost fainted. Yet, at Length, when I considered the ordinary, necessary, and frequent Use that might be made of these my Labours, I was thereby encouraged to go on and prosecute my Work; and how ready and easy I have made it for Practice, will plainly appear, by immediate Inspection, to the meanest Capacity.

Here follows a brief Explanation of the Method and Order of the Book: First, you will find Tables *of the* Sun's Declination, *newly calculated from the best Hypothesis yet discovered, and applied to the* Meridian of London, *whose* Latitude *is* 51d. 32m. *North, and* Longitude, *according to these Tables,* 00d. 00m.— *Next you will find* Tables, *shewing the true Hour and Minute of the Day, the* Sun *being upon any Point of the* Compass, *which* Tables *are as Dials, fitting all Places in the World, whose Pole is elevated not above* 60d. *either North or South: Likewise by these Tables you may know the true* Hour *and* Minute *of the Night, by the Bearing of any of the known* Fixed Stars *between the* Tropics: *Then you will find* Tables *shewing the true* Time *of the* Sun's Rising *and* Setting *with the Length of the Day and Night. Also by these*

Tables

Tables *you may find the true Time of* Riſing *and* Setting *of all the eminent* Fixed Stars *between the Tropics. Next you will find* Tables *ſhewing the* Point of the Compaſs *that the* Sun *and all the abovesaid* Stars *riſe and ſet upon; which Tables are of excellent Uſe for readily finding the* Variation *of the* Compaſs, *and may be performed by a* Meridian Compaſs, *that is about ten Inches in* Diameter, *whoſe Points are divided into Halves and Quarters; ſuch a* Compaſs *I ſuppoſe to be convenient for a Mariner's Uſe, where he hath not an* Azimuth Compaſs. *Next you will find* Tables *of* Amplitudes *to every Degree of the* Sun's Declination: *All theſe* Tables *are calculated from the* Equator *to* 60 *Degrees of* Latitude, *either North or South: and they will laſt, with Exactneſs, as long as* GOD *upholdeth the* Order *and* Courſe *of* Nature.

In the Appendix *you will find the Uſe of all thoſe* Inſtruments *that are moſt in Practice in the Art of* NAVIGATION, *either for Operation or Obſervation: Likewiſe a* Table *containing the moſt principal Harbours, Headlands, and Iſlands in the* WORLD; *ſhewing the* Latitude *and* Longitude *at each of them; beginning the* Longitude *at the* Meridian *of* London; *the Whole diſpoſed in a new, and ſucceſſive Order.*

This Method, I own, but how I have acquited myſelf therein, I ſhall leave to the Judgment and Experience of the moſt ſkilful Mariners that the World affords, which are my native Countrymen in England.

And now fare ever well, ſo wiſhes he,
Who is more yours, than he can ſeem to be.

ANDREW WAKELY.

To the PUBLIC.

SIRS,

BEING desired by the Booksellers concerned herein, I willingly undertook the Examination of this Treatise, (and the rather for that Respect I bear to the Testimony of my Master, the deceased Author) which, for its Usefulness, hath obtained good Esteem from our NAVIGATORS: I therefore have taken the greater Pains, and spent much Time in examining each Table, amending, altering, explaining, and enlarging where I saw Cause, and thus have endeavoured to render the Whole of the MARINER's COMPASS RECTIFIED, most familiar, and easy to an ordinary Capacity.

In this Edition I have contracted the *Table of Amplitudes in Points of the Compass*, and yet as intelligible as before, by which, having made more Room, I have made the Reader Amends with large Additions in the Use of each Table, and methodizing the Discourse throughout; but more especially in the *Use of Instruments*, I have taken Liberty to repair, alter, and enlarge, that it will appear as good as new; but chiefly in the *Description and Use of the Gunter*, *Sliding Gunter*, and *Sector*; principally the

two former, whofe Ufes I have fhewed in *Arithmetic*, to *multiply*, *divide*, and *work* the RULE OF THREE; in *Geometry*, to work *Proportions, continued, Duplicate*, and *Triplicate*; *Menfuration of Superficies* and *Solids*: As to meafure Board, Timber, Stone, Gauging of Veffels, Tunnaging of Ships, Bales, or Boxes; alfo in *Gunnery*; in *Navigation*, both in *Plane* and *Mercator's Sailing*. In *Aftronomy*, the moft ufeful Problems, fuch as to find the Sun's Place, Declination, Rifing, Setting, Amplitude, Azimuth, Hour, and Altitude, at all Times. And in all you are directed plainly to perform them, both by Sliding Gunter and with Compaffes.

In the *Table of Latitudes* and *Longitudes* I have added many Places of Note, and omitted fome few that were of little Moment, and have corrected both the Latitudes and Longitudes of the moft eminent, according to the lateft Obfervations; fo that I am bold to fay, it is the moft exact Table of the Kind extant.

Thefe, with many other Additions through the Whole, I hope will acceptance with young Students in the Mathematics, and prove ferviceable to them, both in the Study and Practice of Navigation, and other Parts of the Mathematics. For whofe Sakes I have taken the greater Pains herein.

JAMES ATKINSON.

TO THE

READER.

IN this Edition of the Mariner's Compafs Rectified, *all the Examples have been recalculated with the greateft Care, and properly adapted to fubfequent Time; the Tables of the* Sun's Declination, Amplitudes, Latitudes *and* Longitudes *of Places, &c. have likewife been compared with, and careful corrected by the lateft and moft accurate* Aftronomic *and* Geographical Obfervations; *to which is added (by way of Appendix) the Situation of the moft effential Iflands, &c. difcovered during* Capt. Cook's *Voyage in his Majefty's Ship the* Refolution *and* Adventure, *towards the South Pole, and round the World, in the Years* 1772, 1773, 1774 *and* 1775, *the fame eftablifhed by Cæleftial Obfervations. Thofe of the* Sun's Declination *are truly computed for the firft four Years, and may very well ferve in common Practice (without any fenfible Error) for all thofe Years refpectively fuperfixd, or fet at the Head of the Tables.*

But if a greater Degree of Accuracy is required, the following Correction may be made at the End of eight Years, viz. *from* March 21*ft to* May 21*ft, and from* September 21*ft to* November 21*ft, add one Minute to the Declination in thefe Tables found, and from* July 21*ft to* September 21*ft; alfo from* January 21*ft to* March 21*ft, fubtract one Minute from the refpective Declination; the Sum, or Difference will be the Declination at that Time corrected nearly.* *The*

First Year after Leap-Year.

Sun's Declination 1781, 1785, 1789, 1793.

Days	Jan. South		Feb. Souuh		March South		April North		May North		June North	
	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
1	22	58	16	55	07	20	04	47	15	15	22	09
2	22	52	16	37	06	57	05	10	15	35	22	17
3	22	46	16	19	06	34	05	33	15	51	22	24
4	22	40	16	01	06	11	05	56	16	08	22	31
5	22	33	15	43	05	48	06	19	16	25	22	38
6	22	26	15	25	05	25	06	41	16	42	22	44
7	22	18	15	06	05	01	07	04	16	59	22	50
8	22	10	14	47	04	38	07	26	17	15	22	55
9	22	01	14	27	04	14	07	48	17	31	23	00
10	21	52	14	08	03	51	08	11	17	47	23	05
11	21	43	13	48	03	27	08	33	18	02	23	09
12	21	33	13	28	03	04	08	54	18	17	23	12
13	21	22	13	08	02	40	09	16	18	32	23	16
14	21	12	12	47	02	16	09	38	18	46	23	19
15	21	01	12	27	01	53	09	59	19	11	23	21
16	20	49	12	06	01	29	10	20	19	14	23	24
17	20	37	11	45	01	05	10	41	19	20	23	25
18	20	25	11	24	00	42	11	02	19	41	23	27
19	20	12	11	02	00	18	11	23	19	54	23	28
20	19	59	10	41	Nor.	06	11	44	20	06	23	28
21	19	45	10	19	00	29	12	04	20	19	23	28
22	19	32	09	57	00	53	12	24	20	30	23	28
23	19	17	09	35	01	17	12	44	20	42	23	27
24	19	03	09	13	01	40	13	04	20	53	23	26
25	18	48	08	51	02	04	13	23	21	04	23	24
26	18	33	08	28	02	27	13	42	21	14	23	22
27	18	17	08	06	02	51	14	02	21	24	23	20
28	18	01	07	43	03	14	14	20	21	34	23	17
29	17	45			03	37	14	39	21	43	23	14
30	17	29			04	01	14	57	21	52	23	10
31	17	12			04	24			22	01		

First after Leap-Year.

Sun's Declination 1781, 1785, 1789, 1793.

Days	July		August		Sept.		Oct.		Nov.		Dec.	
	North		North		North		South		South		South	
	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
1	23	06	17	55	08	06	03	25	14	39	21	56
2	23	02	17	39	07	44	03	48	14	58	22	05
3	23	57	17	24	07	22	04	12	15	17	22	13
4	23	52	17	08	07	00	04	35	15	36	22	21
5	23	46	16	51	06	37	04	58	15	54	22	29
6	22	40	16	35	06	15	05	21	16	12	22	36
7	22	34	16	18	05	52	05	44	16	29	22	43
8	22	27	16	01	05	30	06	07	16	47	22	49
9	22	20	15	44	05	07	06	30	17	04	22	55
10	22	12	15	26	04	44	06	53	17	21	23	00
11	22	04	15	08	04	21	07	15	17	37	23	05
12	21	56	14	50	03	58	07	38	17	54	23	09
13	21	47	14	32	03	35	08	00	18	10	23	13
14	21	38	14	13	03	12	08	23	18	25	23	17
15	21	28	13	55	02	49	08	45	18	40	23	20
16	21	19	13	36	02	26	09	07	18	55	23	22
17	21	08	13	16	02	03	09	29	19	10	23	24
18	20	58	12	57	01	39	09	51	19	24	23	26
19	20	47	12	37	01	16	10	13	19	38	23	27
20	20	36	12	18	00	53	10	34	19	52	23	28
21	20	24	11	58	00	29	10	56	20	05	23	28
22	20	12	11	37	00	06	11	17	20	18	23	28
23	20	00	11	17	Sou	18	11	38	20	30	23	27
24	19	47	10	56	00	41	11	59	20	42	23	26
25	19	34	10	36	01	04	12	20	20	54	23	24
26	19	21	10	15	01	28	12	40	21	06	23	22
27	19	07	09	54	01	51	13	01	21	16	23	19
28	18	54	09	32	02	15	13	21	21	27	23	16
29	18	39	09	11	02	38	13	41	21	37	23	13
30	18	25	08	49	03	02	14	00	21	47	23	09
31	18	10	08	28			14	20			23	04

Second Year after Leap-Year.

Sun's Declination 1782, 1786, 1790, 1794.

Days	Jan.		Feb.		March		April		May		June	
	South		Souuh		South		North		North		North	
	D.	M.	D.	M.	D.	M.	D.	M.	D.	M	D.	M.
1	22	59	16	59	07	26	04	40	15	11	22	07
2	22	54	16	41	07	03	05	04	15	29	22	15
3	22	48	16	24	06	40	05	27	15	47	22	22
4	22	42	16	06	06	17	05	50	16	04	22	29
5	22	35	15	48	05	53	06	13	16	21	22	36
6	22	28	15	29	05	30	06	36	16	38	22	42
7	22	20	15	10	05	07	06	58	16	55	22	48
8	22	12	14	51	04	43	07	21	17	11	22	54
9	22	03	14	32	04	23	07	43	17	27	22	59
10	21	54	14	13	03	57	08	05	17	43	23	03
11	21	45	13	53	03	33	08	27	17	58	23	08
12	21	35	13	33	03	20	08	49	18	14	23	11
13	21	25	13	13	02	46	09	11	18	28	23	15
14	21	14	12	52	02	22	09	32	18	43	23	18
15	21	03	12	32	01	59	09	54	18	57	23	21
16	20	52	12	11	01	35	10	15	19	11	23	23
17	20	40	11	50	01	11	10	36	19	25	23	25
18	20	28	11	29	00	48	10	57	19	38	23	26
19	20	15	11	07	00	24	11	18	19	51	23	27
20	20	02	10	46	00	00	11	39	20	03	23	28
21	19	50	10	24	Nor.	24	11	59	20	16	23	28
22	19	35	10	02	00	47	12	19	20	29	23	28
23	19	21	09	40	01	11	12	39	20	38	23	27
24	19	07	09	18	01	34	12	59	20	50	23	26
25	18	52	08	56	01	58	13	18	21	00	23	25
26	18	37	08	34	02	22	13	38	21	12	23	23
27	18	21	08	11	02	44	13	57	21	22	23	21
28	18	05	07	48	03	08	14	16	21	32	23	18
29	17	49			03	32	14	35	21	41	23	15
30	17	33			03	55	14	53	21	50	23	11
31	17	16			04	18			21	59		

Second after Leap-Year.

Sun's Declination 1782, 1786, 1790, 1794.

Days	July		August		Sept.		Oct.		Nov.		Dec.	
	North		North		North		South		South		South	
	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
1	23	07	17	59	08	11	03	19	14	34	21	54
2	23	03	17	43	07	49	03	43	14	54	22	03
3	22	58	17	28	07	27	04	06	15	12	22	11
4	22	53	17	12	07	05	04	29	15	31	22	19
5	22	47	16	55	06	43	04	52	15	49	22	27
6	22	42	16	39	06	20	05	15	16	07	22	34
7	22	35	16	22	05	58	05	38	16	25	22	41
8	22	28	16	05	05	35	06	01	16	43	22	47
9	22	21	15	48	05	13	06	24	17	00	22	53
10	22	14	15	30	04	50	06	47	17	17	22	59
11	22	06	15	13	04	27	07	10	17	33	23	04
12	21	58	14	55	04	04	07	32	17	50	23	08
13	21	49	14	36	03	41	07	55	18	06	23	12
14	21	40	14	18	03	18	08	17	18	21	23	16
15	21	31	14	00	02	55	08	40	18	37	23	19
16	21	21	13	40	02	32	09	02	18	52	23	22
17	21	11	13	21	02	08	09	24	19	07	23	24
18	21	01	13	02	01	45	09	46	19	21	23	26
19	20	50	12	42	01	22	10	07	19	35	23	27
20	20	39	12	22	00	58	10	29	19	49	23	28
21	20	27	12	02	00	35	10	51	20	02	23	28
22	20	15	11	42	00	12	11	12	20	15	23	28
23	20	03	11	22	Sou	12	11	33	20	27	23	27
24	19	50	11	01	00	35	11	54	20	40	23	26
25	19	38	10	41	00	59	12	15	20	51	23	25
26	19	24	10	20	01	22	12	35	21	03	23	23
27	19	11	09	59	01	46	12	56	21	14	23	20
28	18	57	09	37	02	09	13	16	21	25	23	17
39	18	43	09	16	02	33	13	36	21	35	23	14
30	18	28	08	55	02	56	13	56	21	45	23	10
31	18	14	08	33			14	15			23	06

Third after Leap-Year.

Sun's Declination, 1783, 1787, 1791, 1795.

Days	Jan. South		Feb. South		March South		April North		May North		June North	
	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
1	23	01	17	03	07	31	04	36	15	07	22	05
2	22	55	16	46	07	08	04	59	15	25	22	13
3	22	49	16	28	06	45	05	22	15	43	22	20
4	22	43	16	10	06	22	05	45	16	00	22	28
5	22	37	15	52	05	59	06	08	16	17	22	34
6	22	30	15	34	05	36	06	30	16	34	22	41
7	22	22	15	15	05	13	06	53	16	51	22	47
8	22	14	14	56	04	49	07	15	17	07	22	52
9	22	06	14	37	04	26	07	38	17	23	22	58
10	21	57	14	17	04	02	08	00	17	39	23	02
11	21	47	13	58	03	39	08	22	17	55	23	07
12	21	38	13	38	03	15	08	44	18	10	23	1[illegible]
13	21	28	13	18	02	52	09	06	18	25	23	14
14	21	17	12	57	02	28	09	27	18	40	23	17
15	21	06	12	37	02	09	09	49	18	54	23	20
16	20	55	12	16	01	41	10	10	19	08	23	23
17	20	43	11	55	01	17	10	31	19	22	23	25
18	20	31	11	34	00	53	10	52	19	35	23	26
19	20	18	11	13	00	30	11	13	19	48	23	27
20	20	05	10	51	00	06	11	34	20	01	23	28
21	19	52	10	29	Nor.	18	11	54	20	13	23	28
22	19	38	10	08	00	42	12	14	20	25	23	28
23	19	24	09	46	01	05	12	34	20	36	23	27
24	19	10	09	24	01	29	12	54	20	48	23	26
25	18	55	09	01	01	52	13	14	20	59	23	25
26	18	40	08	39	02	16	13	33	21	09	23	23
27	18	25	08	16	02	39	13	52	21	20	23	21
28	18	09	07	54	03	03	14	11	21	29	23	19
29	17	53			03	26	14	30	21	39	23	16
30	17	37			03	49	14	49	21	48	23	12
31	17	20			04	13			21	57		

Third after Leap - Year.

Sun's Declination, 1783, 1787, 1791, 1795.

Days	July		August		Sept.		Oct.		Nov.		Dec.	
	North		North		North		South		South		South	
	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
1	23	08	18	02	08	17	03	14	14	30	21	52
2	23	04	17	47	07	55	03	37	14	49	22	01
3	22	59	17	31	07	33	04	00	15	08	22	09
4	22	54	17	16	07	10	04	23	15	26	22	18
5	22	49	16	59	06	48	04	47	15	45	22	25
6	22	43	16	43	06	26	05	10	16	03	22	33
7	22	37	16	26	06	03	05	33	16	11	22	40
8	22	31	16	09	05	41	05	56	16	38	22	46
9	22	23	15	52	05	18	06	19	16	56	22	52
10	22	16	15	36	04	55	06	42	17	13	22	58
11	22	08	15	17	04	32	07	04	17	29	23	03
12	22	00	14	59	04	10	07	27	17	46	23	07
13	21	51	14	41	03	47	07	50	18	02	23	11
14	21	42	14	22	03	24	08	12	18	18	23	15
15	21	33	14	04	03	00	08	34	18	33	23	18
16	21	23	14	45	02	37	08	57	18	48	23	21
17	21	13	13	26	02	14	09	19	19	03	23	24
18	21	03	13	08	01	51	09	40	19	18	23	25
19	20	52	12	47	01	27	10	02	19	32	23	27
20	20	41	12	27	01	04	10	24	19	45	23	28
21	20	30	12	07	00	41	10	45	19	59	23	28
22	20	18	11	47	00	17	11	07	20	12	23	28
23	20	06	11	27	Sou.	06	11	28	20	24	23	28
24	19	53	11	06	00	30	11	49	20	37	23	27
25	19	41	10	46	00	53	12	10	20	49	23	25
26	19	28	10	25	01	17	12	30	21	00	23	23
27	19	14	10	04	01	40	12	51	21	11	23	21
28	19	02	09	43	02	04	13	01	21	22	23	18
29	18	46	09	21	02	27	13	31	21	32	23	15
30	18	32	09	00	02	50	13	51	21	42	23	11
31	18	17	08	38			14	10			23	07

Leap-Year.

Sun's Declination, 1780, 1784, 1788, 1792.

Days	Jan. South		Feb. South		March South		April North		May North		June North	
	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
1	23	02	17	07	07	14	04	50	15	21	22	11
2	22	57	16	50	06	51	05	16	15	38	22	19
3	22	51	16	32	06	28	05	39	15	56	22	26
4	22	45	16	15	06	05	06	02	16	13	22	33
5	22	38	15	57	05	42	06	25	16	30	22	39
6	22	31	15	38	05	18	06	47	16	47	22	45
7	22	24	15	20	04	55	07	10	17	03	22	51
8	22	16	15	01	04	31	07	32	17	20	22	56
9	22	08	14	41	04	08	07	55	17	36	23	01
10	21	59	14	22	03	44	08	17	17	51	23	06
11	21	50	14	02	03	21	08	39	18	06	23	10
12	21	40	13	43	02	57	09	00	18	21	23	14
13	21	30	13	23	02	34	09	22	18	36	23	17
14	21	20	13	02	02	10	09	44	18	51	23	20
15	21	09	12	42	01	46	10	05	19	05	23	22
16	20	58	12	21	01	23	10	26	19	18	28	24
17	20	46	12	00	00	59	10	47	19	32	22	26
18	20	34	11	39	00	35	11	08	19	45	23	27
19	20	21	11	18	00	12	11	29	19	58	23	28
20	20	09	10	56	Nor.	12	11	49	20	18	23	28
21	19	55	10	35	00	36	12	09	20	20	23	28
22	19	42	10	13	00	59	12	30	20	34	23	28
23	19	28	09	51	01	23	12	49	20	45	23	27
24	19	14	09	29	01	47	13	09	20	56	23	26
25	18	59	09	07	02	10	13	29	21	07	23	24
26	18	44	08	44	02	34	13	48	21	17	23	22
27	18	29	08	22	02	57	14	07	21	27	23	19
28	18	13	07	59	03	20	14	26	21	37	23	16
29	17	57	07	37	03	44	14	44	21	46	23	13
30	17	44			04	07	15	02	21	55	23	09
31	17	24			04	31			22	03		

Leap - Year.

Sun's Declination, 1780, 1784, 1788, 1792.

	July		August		Sept.		Oct.		Nov.		Dec.	
	North		North		North		South		South		South	
	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
1	23	05	17	51	08	00	03	31	14	44	21	59
2	23	01	17	35	07	38	03	55	15	03	22	07
3	22	56	17	19	07	16	04	18	15	22	22	16
4	22	50	17	03	06	54	04	41	15	40	22	24
5	22	45	16	47	06	31	05	04	15	59	22	31
6	22	38	16	50	06	09	05	27	16	17	22	38
7	22	33	16	13	05	46	05	50	16	34	22	45
8	22	25	15	56	05	24	06	13	16	52	22	51
9	22	18	15	39	05	01	06	36	17	09	22	56
10	22	10	15	21	04	38	06	59	17	25	23	02
11	22	02	15	03	04	15	07	21	17	42	23	06
12	21	53	14	45	03	52	07	44	17	58	23	11
13	21	45	14	27	03	29	08	06	18	14	23	14
14	21	35	14	08	03	06	08	29	18	29	23	18
15	21	26	13	19	02	45	08	51	18	45	23	21
16	21	16	13	30	02	20	09	13	19	00	23	23
17	21	06	13	11	01	56	09	35	19	14	23	25
18	20	55	12	52	01	33	09	57	19	28	23	27
19	20	44	12	32	01	10	10	19	19	42	23	27
20	20	33	12	12	00	46	10	40	19	56	23	28
21	20	21	11	52	00	23	11	02	20	09	23	28
22	20	09	11	32	00	00	11	23	20	21	23	28
23	19	57	11	11	Sou.	24	11	44	20	34	23	27
24	19	44	10	51	00	47	12	05	20	46	23	26
25	19	31	10	30	01	11	12	25	20	57	23	24
26	19	17	10	09	01	34	12	46	21	09	23	22
27	19	04	09	48	01	58	13	06	21	19	23	19
28	18	50	09	27	02	21	13	26	21	30	23	16
29	18	35	09	06	02	45	13	46	21	40	23	12
30	18	21	08	44	03	08	14	06	21	49	23	08
31	18	06	08	22			14	25			23	03

A Description of the TABLES of the SUN's DECLINATION.

THESE Tables are in general for Four Years; Leap-Year, First, Second and Third Year after Leap Year, and consequently for any Year.

Each Year (taking up two Pages) hath the first Six Months of the Year on the Left-hand Page, and the last six Months are on the Right-hand Page, the Names of the Months are at the Head of each Column, and the Days of each Month in the Left-hand Column of each Page.

The first Table sheweth the Sun's Declination every Day for the first Years after Leap-Year, being 1781, 1785, 1789, 1793, &c. and takes up Pages (10 and 11:) The second Table is for 1782, 1786, 1790, 1794, &c. being the second Year after Leap-Year in Pages (12) and (13): The next Table in Pages (14) (15) is for the Third Year after Leap-Year: The Fourth Table in Pages (16) and (17) sheweth the Sun's Declination for Leap-Years, being 1780, 1784, 1788, 1792, &c.

Under the Name of the Month, is the Name of the Declination either North or South, only the Column for March and September hath two Names; that is, under March is South, and against the 21st or 20th Day (according as it is Leap-Year, or 1st, 2d, 3d Year after) is Nor. for North; and under September is North, and against the 23d or 24th Day is Sou. for South; intimating that the Declination is South in March, till the 21st or 20th Day, and all the remaining Part of the Month it is North or Nor. in like manner in September, it is North till the 23d, or 24th Day, and from thence to the Months end it is South or Sou.

The

The Uſe of the Tables of Declination.

TO find the Sun's Declination for any Day in any Year, is after this Manner.

1. Seek the Year and Month, at the Head of the Table; and the Day of the Month in the Left-hand Column.

2. Then right under the Month, at the Head of the Table, and againſt the Day of the Month in the Left-hand Column, is the Sun's Declination required.

Example 1. I deſire to know the Sun's Declination for the 24th Day of April, 1782.

The Year 1782, is the ſecond Year after Leap-Year, which is in Page (12); then under April, and againſt 24 (under Days) is 12.59, with North at the Head of the Table under April; which ſheweth the Sun's Declination on the 24th of April, 1786, is 12d. 59m. North.

Example 2. What is the Sun's Declination of the 21ſt of March, 1780.

The Year 1780, being Leap-Year, is found in Page 16; then againſt the 21ſt Day, and under March, is Nor. 0.36; ſignifying the Sun's Declination at that Time is 00d. 36m. North; the like do for any other Time.

A TABLE to Proportion the Sun's Declination to any other Meridian.

Incr. } Add. Decr. } Subt.	Degrees of Longitude	The daily Difference in Declination											
		min 2 m	min 4 m	min 6 m	min 8 m	min 10 m	min 12 m	min 14 m	min 16 m	min 18 m	min 20 m	min 22 m	min 24 m
West Long Dec.	15	0	0	0	0	0	0	1	1	1	1	1	1
	30	0	0	0	1	1	1	1	1	1	2	2	2
	45	0	0	1	1	1	1	2	2	2	2	3	3
	60	0	0	1	1	2	2	2	3	3	3	4	4
	75	0	1	1	2	2	2	3	3	4	4	5	5
Incr. } Subt. Decr. } Add.	90	0	1	1	2	2	3	3	4	4	5	5	6
East Long. Decl.	105	1	1	2	2	3	3	4	5	5	6	6	7
	120	1	1	2	3	3	4	5	5	6	7	7	8
	135	1	1	2	3	4	4	5	6	7	7	8	9
	150	1	2	2	3	4	5	6	7	7	8	9	10
	165	1	2	3	4	5	5	6	7	8	9	10	11
	180	1	2	3	4	5	6	7	8	9	10	11	12

The Uſe of this TABLE of Proportion.

THE Tables of the Sun's Declination are calculated for the Meridian of *London*, and will ſerve for any Place under that Meridian; but for thoſe Places ſituate Eaſterly or Weſterly from it, the Declination muſt be proportioned according to its daily Difference in the Table, and Longitude of thoſe Places from the Meridian of *London*; for which Purpoſe this Table is uſeful, as is evident by theſe Examples.

Example

Example 1.

Admit the 10th Day of April, Anno 1782, I am in Longitude 105d. East; I demand what Declination the Sun will have that Day in the Meridian of that Place?

The Declination for April the 10th, in the Meridian of London is 08d. 05m. increasing, and the daily Difference at that Time is 22m. therefore in this Table look in the Head thereof for the Number 22, or nearest thereunto, if not in the Table; then look on the Left-hand of the Table for 105d. (or the nearest thereto) the Longitude I am in, and in the common Angle of meeting is 6 Min. which is to be deducted from the Declination in the Meridian of London aforesaid 8d. 05m. and the Remainder will be the Declination for that Meridian, or the Longitude I am in, which is 08d. 58m. North. But if the Declination has decreased, as it doth here increase, then you must have added, as hereunder you may see.

	d.	m.
The Declination in the Meridian of London is	08 :	05N.
The proportional Minutes subtract ————	00 :	06
The Decl. for the Longitude of 105d. East is	07 :	59N.
The Decl. for the Longitude of 105d. West is	08 :	11

Example 2.

Admit the 10th Day of October, Anno 1780, I am in Longitude 87d. West: I demand what Declination the Sun will have that Day in that Meridian?

The daily Difference in the Table of Declination at this Time is 23m. and the proportional Part thereof by the last Table is 5 min. increasing.

	d.	m.
The Declination in the Meridian of London —	06 :	59 S
The proportional Minutes add ————————	00 :	05
The Declination in the Long. of 87d. West is	07 :	04 S
The Declination for the Long. of 87d. East is	06 :	54 S

A TABLE of Refraction, deduced from Mr. Flamftead's Obfervations, made at the Royal Obfervatory at Greenwich.

Altitudes.	Refract.	Altitudes.	Refract.	Altitudes.	Refract.	Altitudes.	Refract.
D.	M.S.	D.	M.S.	D.	M.S.	D.	M.S.
00	33.00	10	4.43	25	1.47	40	0.58
00½	26.38	11	4.16	26	1.40	41	0.56
01	23.22	12	3.55	27	1.36	42	0.54
01½	20.17	13	3.39	28	1.31	43	0.52
02	17.26	14	3.23	29	1.27	44	0.50
02½	15.15	15	3.00	30	1.23	45	0.48
03	13.23	16	2.58	31	1.20	46	0.46
03½	11.53	17	2.48	32	1.17	47	0.45
04	10.39	18	2.39	33	1.14	48	0.44
04½	9.38	19	2.31	34	1.11	49	0.42
05	8.48	20	2.24	35	1.09	50	0.40
06	7.47	21	2.11	36	1.07	55	0.35
07	6.45	22	2.01	37	1.05	60	0.30
08	5.57	23	2.00	38	1.02	70	0.19
09	5.22	24	1.50	39	1.00	80	0.10
10	4.43	25	1.47	40	1.58	90	0.00

The Refraction of the Sun, Moon and Stars, caufeth them to appear higher above the Horizon then they are; therefore the Refraction is always to be fubtracted from the Altitude obferved, that the true Altitude may be had.

As, admit the Sun's Meridian Altitude, by Obfervation, to be 5 Degrees; I demand the true Altitude.

	d.	m.
Altitude by Obfervation being - - - - - - -	05 :	00
Sun's Refraction 8 m. 58 f. fubtract - - - -	00 :	09
The Sun's true Meridian Altitude is - - - -	04 :	51

Primum



PRIMUM MOBILE:

O R,

Aſtronomic Tables;

Each TABLE being

A SUN-DIAL,

SHEWING

The exact Hour of the Day, the Sun being upon any Point of the Compaſs; fitting all Places upon the Earth and Sea, that lie between the Equator and 60 Degrees of Latitude, either North or South: And to laſt with Exactneſs as long as the Omnipotent and Everlaſting Creator ſhall be pleaſed to conſerve the great and wonderful Fabric of Nature.

A Sun-Dial for the Latitude of 0 Degree.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
North	12	12	12	12	12	12	12	12	12	12	12
n by w	Zen. West.	0.02	0.04	0.06	0.08	0.10	0.12	0.14	0.17	0.19	0.20
n n w		0.04	0.08	0.12	0.17	0.21	0.25	0.30	0.35	0.39	0.41
nw by n		0.07	0.13	0.20	0.27	0.34	0.41	0.49	0.56	1.03	1.07
n w		0.10	0.20	0.30	0.41	0.51	1.02	1.14	1.25	1.35	1.43
nw by w		0.15	0.30	0.45	1.01	1.18	1.35	1.53	2.12	2.29	2.42
w n w		0.24	0.49	1.14	1.41	2.09	2.41	3.18	4.06	5.11	
w by n		0.51	1.44	2.46	4.10						
West											
☉ set	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
Sun's Ampl.	d m 0 00	d m 2.30	d m 5.00	d m 7.30	d m 10.0	d m 12.30	d m 15.0	d m 17.30	d m 20.0	d m 22.0	d m 23.29

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	Zen. West.	0.02	0.04	0.06	0.08	0.10	0.12	0.14	0.17	0.19	0.20
s s w		0.04	0.08	0.12	0.17	0.21	0.25	0.30	0.35	0.39	0.41
sw by s		0.07	0.13	0.20	0.27	0.34	0.41	0.49	0.56	1.03	1.07
s w		0.10	0.20	0.30	0.41	0.51	1.02	1.14	1.25	1.35	1.43
sw by w		0.15	0.30	0.45	1.01	1.18	1.35	1.53	2.12	2.29	2.42
w s w		0.24	0.49	1.14	1.41	2.09	2.41	3.18	4.06	5.11	
w by s		0.51	1.44	2.46	4.10						
West											
☉ set	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00

A Sun-Dial for the Latitude of 1 Degree.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
North	12	12	12	12	12	12	12	12	12	12	12
n by w	Zen. West.	0.01	0.03	0.05	0.07	0 09	0.11	0.14	0.16	0 18	0.19
n n w		0.02	0.06	0 10	0.15	0.19	0.23	0.27	0 32	0.36	0.38
nw b n		0.04	0.11	0.17	0.24	0.31	0.38	0.46	0.53	1.00	1.04
n w		0.06	0.16	0.26	0.37	0.47	0 58	1.09	1.21	1.31	1.39
nw by w		0.09	0.24	0.39	0.56	1.12	1.29	1.47	2.06	2.21	2.35
w n w		0.14	0.39	1.04	1.31	1.59	2.30	3.07	3.54	4.53	
w by n		0.30	1.24	2.25	3 48						
West	6 00										
☉ set	6.00	6.00	6.00	6.00	6.01	6 01	6 01	6.01	6 01	6 02	6.02
Sun's Ampl.	d m 0.00	d m 2.00	d m 5.00	d m 7.30	d m 10.0	d m 12.30	d m 15.0	d m 17.30	d m 20.0	d m 22.0	d m 23.29

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.01	0.03	0.05	0.07	0.09	0.11	0.13	0.15	0.17	0.19	0.21
s s w	0.02	0.06	0.10	0.14	0.18	0.22	0.26	0.31	0.3[illegible]	0.39	0.42
sw by s	0.03	0 09	0.16	0.23	0.30	0.37	0.44	0.51	0.59	1.05	1.10
s w	0.04	0.14	0.24	0.34	0.45	0 55	1.06	1.17	1.29	1 39	1.47
sw by w	0.06	0.21	0.36	0.51	1.07	1.2[illegible]	1.40	1.57	2.17	2 31	2.46
w s w	0.10	0.34	0 58	1.23	1.50	2.18	2.50	3.26	4.13	5.13	
w by s	0.20	1.11	2 04	3.05	4.28						
West	6.00										
☉ set	6.00	6.00	6.00	6.00	5.59	5 59	5.59	5.59	5.59	5.58	5.58

A Sun-Dial for the Latitude of 2 Degrees.

NORTH DECLINATION.

0 d	Deg. Min.	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
h m	Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
12	North	12	12	12	12	12	12	12	12	12	12
0.02	n by w	Zen. West.	0.02	0.04	0.06	0.09	0.11	0.13	0.15	0.17	0.18
0.03	n n w		0.05	0.09	0.13	0.18	0.22	0.27	0.32	0.35	0.38
0.05	nw by n		0.08	0.15	0.22	0.29	0.36	0.44	0.51	0.57	1.02
0.08	n w		0.12	0.22	0.33	0.43	0.54	1.05	1.17	1.27	1.34
0.12	nw byw		0.28	0.33	0.49	1.05	1.22	1.40	2.00	2.16	2.29
0.20	w n w		0.29	0.55	1.21	1.50	2.21	2.58	3.45	4.46	
0.40	w by n		1.03	2.03	3.23						
6.00	West										
6.00	⊙ set	6 00	6.00	6.00	6.01	6.02	6.02	6.02	6.03	6 03	6.04
d m	Sun's	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
0 00	Ampl.	2.30	5.00	7.30	10.0	12.30	15.0	17.31	20.	22.1	23.30

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.02	0.04	0.06	0.08	0.10	0.12	0.14	0.16	0.18	0.20	0.22
s s w	0.03	0.07	0.12	0 16	0.20	0.25	0.29	0.34	0.38	0.42	0.45
sw by s	0.05	0.12	0.19	0.25	0 32	0 39	0.46	0.54	1.01	1.08	1.12
s w	0.08	0.18	0.28	0 38	0.48	0.59	1 10	1.21	1.33	1.42	1.50
sw by w	0.12	0.27	0.42	0.57	1.13	1.29	1.46	2.04	2.23	2.40	2.53
w s w	0.20	0 43	1.08	1.33	2.00	2.28	3.00	3.36	4.24	5.24	
w by s	0.40	1.30	2.22	3.22	4.43						
West	6.00										
⊙ set	6.00	6.00	6.00	5.59	5.59	5.58	5.58	5.58	5.57	5.57	5.56

A Sun-Dial for the Latitude of 3 Degrees.

NORTH DECLINATION.

0 d	Deg. Min.	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
h m	Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
12	North	12	12	12	12	12	12	12	12	12	12
0.02	n by w	Zen. West.	0.02	0.04	0.06	0.09	0.10	0.12	0.14	0.16	0.17
0.05	n n w		0.03	0.07	0.12	0.16	0.20	0.25	0.29	0.33	0.36
0.08	nw b n		0.05	0.12	0.19	0.26	0.33	0.40	0.48	0.54	0.59
0.12	n w		0.08	0.18	0.29	0.39	0.50	1.01	1.13	1.23	1.31
0.18	nwbyw		0.12	0.27	0.43	0.59	1.16	1.34	1.54	2.10	2.24
0.29	w n w		0.20	0.45	1.11	1.39	2.11	2.47	3.33	4.33	
0.59	w by n		0.42	1.40	2.57						
6.00	West										
6.00	⊙ set	6.00	6.00	6.01	6.02	6.02	6.03	6.04	6.04	6.05	6.05
d m	Sun's	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
0.00	Ampl.	2.30	5.00	7.30	10.1	12.31	15.1	17.31	20.2	22.2	23.32

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.02	0.05	0.07	0.09	0.11	0.13	0.15	0.17	0.19	0.21	0.22
s s w	0.05	0.09	0.13	0.18	0.22	0.26	0.31	0.35	0.40	0.44	0.47
sw by s	0.08	0.15	0.21	0.28	0.35	0.42	0.49	0.56	1.04	1.10	1.15
s w	0.12	0.22	0.32	0.42	0.53	1.03	1.14	1.26	1.37	1.47	1.55
sw by w	0.18	0.33	0.48	1.03	1.19	1.35	1.52	2.10	2.30	2.45	3.00
w s w	0.29	0.53	1.17	1.42	2.09	2.37	3.09	3.45	4.32	5.31	[illegible]
w by s	0.59	1.48	2.40	3.38	4.55						
West	6.00										
⊙ set	6.00	6.00	6.00	5.59	5.58	5.58	5.57	5.56	5.56	5.55	5.5

A Sun-Dial for the Latitude of 4 Degrees.

NORTH DECLINATION.

Deg Min	2 d 30m	Deg. Min	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 0m	20 d	22 d	23 d 29m
Point	h m	Point	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	North	12	12	12	12	12	12	12	12	12
s by w	0 01	n by w	0.01	0.03	0.05	0.07	0 09	0.11	0.13	0.15	0.17
s s w	0.02	n n w	0 02	0.06	0 10	0.14	0.19	0.23	0 28	0.37	0.35
sw by s	0.04	nw by w	0.03	0.09	0.16	0.23	0.30	0.38	0.45	0.52	0.57
s w	0 06	nw	0.04	.14	0.24	0.35	0 46	0 57	1 09	1.19	1.27
sw by w	0.09	nw by n	0.06	0.2	0.3	0.53	1 10	1.28	1.47	2.04	2.17
w s w	0.14	w n w	0.10	0.35	1.01	1.29	2.00	2.36	3.21	4.17	
w by s	0.29	w by n	0.21	1.17	2.29						
West	3.25	West									
⊙ set	6.00	⊙ set	6 01	6.02	6 03	6.03	6.04	6 05	6.06	6 06	6.07
Sun's Ampl.	d m 2.30	Sun's Amp.	d m 5.00	d m 7.31	d m 10.1	d m 12.31	d m 15 2	d m 17.3	d m 20.3	d m 22.3	d m 23.33

SOUTH DECLINATION

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.03	0 0[illegible]	0 07	0.09	0.11	0.13	0.16	0.18	0.20	0.22	0.23
s s w	0.07	0.11	0.15	0.19	0.23	0.28	0 32	0.36	0 41	0.45	0.48
sw by s	0 11	0.1[illegible]	0 24	0.31	0 38	0 45	0.52	0.59	1.07	1.13	1.18
s w	0.16	0.2[illegible]	0.36	0.46	0.56	1.07	1.18	1.29	1.41	1.51	1 58
sw by w	0.24	0.39	0.54	1.09	1.2[illegible]	1 41	1.58	2.15	2.35	2.51	3 04
w s w	0 38	1.02	1.26	1.51	2.17	2.45	3.17	3.52	4 38	5.33	
w by s	1 17	2.05	2 55	3.51	5.04						
West	6 00										
⊙ set	6 00	6.00	5 5[illegible]	5.58	5.57	5.5[illegible]	5.56	5.55	5.54	5.54	5.53

A Sun-Dial for the Latitude of 5 Degrees.

NORTH DECLINATION.

Deg Min	0 d	Deg. Min.	5 d 30m	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	Point	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	North	12	12	12	12	12	12	12	12	12
s by w	0.02	n by w	Zen. Weſt.	0.02	0.01	0.06	0 08	0.10	0 12	0.14	0.16
s s w	0.04	n n w		0.04	0 08	0.12	0.18	0.22	0.26	0.30	0.33
sw by s	0.07	nw byn		0.07	0.14	0.21	0.28	0 35	0.43	0.49	0.54
s w	0.10	n w		0 1	0.20	0.31	0 42	0.53	1.05	1.15	1.22
sw byw	0.16	nw bw		0.15	0.31	0.47	1.04	1.21	1.40	1.57	2.10
w s w	0.24	w n w		0.25	0.51	1.18	1.49	2.24	3.08	4.00	
w by s	0.48	w by n		0.54	2.01						
Weſt	4.00	Weſt									
⊙ ſet	6.01	⊙ ſet	6.02	6.03	6.04	5.04	6.05	6.06	6.07	6.08	6.09
Sun's Ampl	d m 2.30	Sun's Amp	d m 5.01	d m 7.31	d m 10.2	d m 12.32	d m 15.2	d m 17.34	d m 20.5	d m 2.5	d m 23.35

SOUTH DECLINATION.

Deg Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.04	0.06	0.08	0.10	0.12	0.14	0 16	0.18	0.20	0 22	0.24
s s w	0.08	0.12	0.15	0.21	0.25	0.29	0.34	0 38	0 43	0 47	0.50
sw by s	0.13	0.20	0.27	0 33	0.40	0 47	0.54	1.02	1.09	1.16	1.21
s w	0.20	0.30	0.40	0.50	1.00	1.11	1.22	1.33	1.45	1.55	2.07
w by w	0.30	0.45	1.00	1.15	1.31	1.46	2.03	2.21	2.40	2.56	3.11
w s w	0.48	1.11	1 35	2.00	2.26	2.53	3.24	3 59	4.42	5.35	
w by s	1.35	2.21	3 09	4.03	5.11						
Weſt	6 00										
⊙ ſet	6.00	5.59	5.58	5.57	5.56	5.56	5.55	5.54	5.53	5.52	5.51

A Sun-Dial for the Latitude of 6 Degrees.

NORTH DECLINATION.

Deg. Min	2 d 30m	5 d	Deg. Min	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	Point	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	North	12	12	12	12	12	12	12	12
s by w	0.03	0.01	n by w	0.01	0.03	0.05	0.07	0.09	0.12	0.13	0.15
s s w	0.06	0.02	n n w	0.03	0.07	0.11	0.15	0.20	0.25	0.28	0.31
swby s	0.09	0.0	nw by w	0.04	0.11	0.18	0.25	0.32	0.40	0.46	0.51
s w	0.14	0.04	nw	0.06	0.16	0.27	0.38	0.49	1.01	1.10	1.18
sw by w	0.21	0.06	nw by n	0.09	0.25	0.41	0.57	1.15	1.34	1.50	2.04
w s w	0.33	0.09	w n w	0.1[illegible]	0.40	1.08	1.38	2.12	2.55	3.44	
w by s	1.06	0.20	w by n	0.32	1.34	3.24					
West	4.22	2.15	West								
⊙ set	6.01	6.02	set	6.03	6.04	6.05	6.06	6.07	6.09	6.10	6.11
Sun's Ampl.	d m 2.30	d m 5.01	Sun's Amp.	d m 7.32	d m 10.3	d m 12.34	d m 15.5	d m 17.36	d m 20.6	d m 22.7	d m 23.27

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.05	0.07	0.09	0.11	0.13	0.15	0.17	0.19	0.21	0.23	0.24
s s w	0.10	0.14	0.18	0.22	0.27	0.31	0.35	0.40	0.44	0.48	0.51
sw by s	0.16	0.23	0.29	0.36	0.43	0.50	0.57	1.04	1.12	1.18	1.23
s w	0.24	0.34	0.44	0.54	1.04	1.15	1.25	1.37	1.48	1.58	2.06
sw by w	0.36	0.50	1.05	1.20	1.36	1.52	2.08	2.26	2.45	3.01	3.15
w s w	0.57	1.20	1.44	2.08	2.34	3.01	3.31	4.06	4.48	5.37	
w by s	0.51	2.35	5.22	4.13	5.16						
West	6.00										
⊙ set	6.00	5.59	5.58	5.57	5.56	5.55	5.54	5.53	5.51	5.50	5.49

A Sun-Dial for the Latitude of 7 Degrees.

NORTH DECLINATION.

Deg. Min	0 d	5 d 30m	Deg. Min.	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	Point	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	North	12	12	12	12	12	12	12	12
s by w	0.04	0.02	n by w	0.00	0.02	0.0[illegible]	0.07	0.09	0.11	0.13	0.14
s s w	0.07	0,03	n n w	0.01	0.05	0.09	0.14	0.18	0.23	0.27	0.30
sw by s	0.12	0.05	nw by n	0.01	0.08	0.15	0.22	0.29	0.37	0.44	0.48
s w	0.18	0.08	n w	0.02	0.12	0.23	0.33	0.45	0.56	1.06	1.14
sw by w	0.27	0.12	nw by w	0.03	0.18	0.34	0.51	1.08	1.27	1.43	1.57
w s w	0.43	0.19	w n w	0.05	0.30	0.5	1.27	2.00	3.42	3.28	
w by s	1.23	0.39	w by n	0.10	1.08	2.36					
West	4.37	2.58									
w by n											
w n w											
⊙ set	6.01	6.02	⊙ set	6.03	6.05	6.06	6.08	6.09	6.10	6.11	6.12
Sun's Ampl.	d m 2.31	d m 5.02	Sun's Amp.	d m 7.33	d m 10.2	d m 12.35	d m 15.7	d m 17.38	d m 20.9	d m 22.10	d m 23.40

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.06	0.07	0.09	0.11	0.13	0.16	0.18	0.20	0.22	0.24	0.25
s s w	0.12	0.16	0.20	0.24	0.28	0.33	0.37	0.41	0.46	0.50	0.53
sw by s	0.19	0.25	0.32	0.39	0.45	0.52	0.59	1.07	1.15	1.21	1.25
s w	0.28	0.38	0.48	0.58	1.08	1.18	1.29	1.40	1.52	2.02	2.09
w by w	0.41	0.56	1.11	1.26	1.41	1.57	2.14	2.31	2.50	3.07	3.19
w s w	1.06	1.29	1.52	2.16	2.41	3.08	3.38	4.12	4.52	5.39	
w by s	2.06	2.49	3.33	4.22	5.20						
West	6.00										
⊙ set	6.00	5.59	5.58	5.57	5.55	5.54	5.52	5.51	5.50	5.49	5.48

A Sun-Dial for the Latitude of 8 Degrees.

NORTH DECLINATION.

Min. Deg.	2 d	5 d 30m	7 d 30m	Deg. Min.	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	Point	h m	h m	h m	h m	h m	m h	h m
South	12	12	12	North	12	12	12	12	12	12	12
s by w	0.04	0.02	0.00	n by w	0.02	0.04	0.06	0.08	0.10	0,12	0.13
s s w	0.09	0.05	0.01	n n w	0.03	0 08	0.12	0 16	0.21	0 25	0 28
sw by s	0.15	0.08	0.01	nwbyw	0.05	0.12	0.20	0.27	0.34	0.41	0.45
s w	0.22	0.12	0.02	n w	0.08	0.18	0.29	0.40	0.52	1.02	1.09
sw by w	0.33	0.18	0.03	nwbyw	0.12	0.28	0.45	1.02	1.20	1.35	1.49
w s w	0.52	0.25	0.05	w n w	0.20	0.46	1.16	1.48	2 28	3.11	4.06
w by s	1.39	0.56	0.10	w by n	0.44	0.59					
Weſt	4.48	3.26	1.22	Weſt							
⊙ ſet	6.01	6.03	6 04	⊙ ſet	6.06	6.07	6.09	6.10	6.12	6.13	9.14
Sun's	d m	d m	d m	Sun's	d m	d m	d m	d m	d m	d m	d m
Ampl.	2.31	5.02	7.34	Amp.	10.6	12.38	15.9	17,40	20.12	22.13	23.45

SOUTH DECLINATION

Deg. Mim.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 p	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.06	0.08	0.10	0.12	0.14	0.16	0 18	0.21	0.23	0.25	0.26
s s w	0.13	0.17	0.21	0.26	0 30	0.34	0.38	0.43	0.47	0 51	0.54
sw by s	0.21	0.28	0.34	0.41	0.48	0.55	1,02	1.09	1.17	1.23	1.28
s w	0.32	0.41	0.51	1.01	1.11	1.22	1.33	1.44	1.55	2.05	2.13
sw by w	0.47	1.02	1.16	1.31	1.46	2 02	2.19	2 36	2.55	3.09	3.22
w s w	1.14	1.37	2.00	2.24	2.48	3.15	3.44	4.17	4.56	5.30	
w by s	2.20	3.01	3 44	4.30	5.24						
Weſt	6.00										
⊙ ſet	6.00	5.59	5.57	5.56	5.54	5.53	5.51	5.50	5.48	5.47	5.46

A Sun-Dial for the Latitude of 9 Degrees.

NORTH DECLINATION.

Deg. Min.	2 d 30m	5 d	7 d 30m	Deg. Min.	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	Point	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	North	12	12	12	12	12	12	12
s by w	0.05	0.01	0.01	n by w	0.01	0.03	0.05	0.07	0.09	0 11	0.12
s s w	0.11	0.07	0.03	n n w	0.02	0.06	0.10	0.14	0.19	0.23	0.26
sw by s	0.17	0.11	0.04	nw by n	0.03	0.10	0.17	0.24	0.31	0.38	0.43
s w	0.26	0.16	0.06	n w	0.04	0.14	0.25	0.36	0.47	0.57	1.05
sw by w	0.38	0.24	0 09	nw byw	0.06	0.22	0.38	0.55	1.13	1.30	1.42
w s w	1.00	0.38	0.14	w n w	0.10	0.36	1.04	1.36	2.15	2.55	3.42
w by s	1.53	1.13	0,29	w by n	0.21	1.2 7					
Weſt	4.56	3.46	2.15								
☉ ſet	6.01	6.03	6.04	☉ ſet	6.06	6.08	6.10	6.12	6.14	6.15	6.16
Sun's Amp.	d m 2.31	d m 5.03	d m 7.35	Sun's Ampl.	d m 10.7	d m 12.39	d m 15.11	d m 17.43	d m 20.16	d m 22.18	d m 23.5[illegible]

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.07	0.09	0.11	0.13	0.15	0.17	0 19	0.21	0.23	0.25	0.26
s s w	0.15	0.19	0.23	0.27	0.31	0.36	0.40	0.44	0.49	0.52	0.56
sw by s	0.24	0.30	0.37	0.44	0.50	0.57	1 04	1.12	1.19	1.25	1.31
s w	0.36	0.45	0.55	1.05	1.15	1.26	1.36	1.47	1.59	2.09	2.16
sw byw	0.53	1.07	1.22	1.36	1.52	2.07	2.24	2.41	2.59	3.14	3.28
w s w	1.23	1.45	2.08	2.31	2.55	3.21	3.50	4.22	5.00	5.40	
w by s	2.33	3.12	2.53	4.35	5.27						
Weſt	6.00										
☉ ſet	6.00	5.59	5.57	5.56	5.54	5.52	5 50	5.48	5.46	5 45	5.44

A Sun-Dial for the Latitude of 10 Degrees.

NORTH DECLINATION.

Min. Deg.	2 d 30m	5 d	7 d 30m	10 d	Deg. Min.	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	Point	h m	h m	h m	h m	m h	h m
South	12	12	12	12	North	12	12	12	12	12	12
s by w	0.06	0.04	0.02	Zen. West.	n by w	0.02	0.04	0.06	0.08	0.10	0.12
s s w	0.12	0.08	0.04		n n w	0.04	0.09	0.13	0.18	0,21	0.24
sw by s	0.20	0.13	0.07		nw by n	0.07	0.14	0 21	0.29	0.35	0.40
s w	0.30	0.20	0.10		n w	0.10	0.21	0.32	0.43	0.53	1.00
sw by w	0.44	0.30	0.15		nw by w	0.15	0.32	0.49	1.06	1.23	1,35
w s w	1.09	0.47	0.24		w n w	0.25	0.53	1.24	2.01	2.39	3.19
w by s	2.07	1.28	0.47		w by n	0.59	1.07				
West	5.03	4.01	2.47		West						
⊙ set	6.02	6.04	6.05	6.07	⊙ set	6.09	6.11	6.13	6.15	6.16	6.17
Sun's Ampl.	d m 2.32	d m 5.05	d m 7.37	d m 10.10	Sun's Amp.	d m 12.42	d m 15.15	d m 17,47	d m 20.20	d m 22.22	d m 23.54

SOUTH DECLINATION

Deg. Mim.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.08	0.10	0.12	0.14	0.16	0.18	0.20	0.22	0.24	0.26	0.27
s s w	0.16	0.21	0.25	0.29	0.33	0.37	0.42	0.46	0.51	0.54	0.57
sw by s	0.26	0.33	0.40	0.46	0.53	1.00	1,07	1.14	1.22	1.28	1.33
s w	0.39	0.49	0.59	1.09	1.19	1.29	1.40	1.51	2.02	2.12	2.19
sw by w	0.58	1.13	1.27	1.42	1.57	2.12	2.28	2.45	3.03	3.19	3.32
w s w	1.31	1.53	2.15	2.38	3.02	3.27	3.55	4 26	5.03	5.41	
w by s	2.44	3.22	4.01	4.42	5.29						
West	6.00										
⊙ set	6.00	5.58	5.56	5.55	5.53	5.51	5.49	5.47	5.45	5.44	5.43

A Sun-Dial for the Latitude of 11 Degrees

NORTH DECLINATION.

Deg. Min.	2 d	5 d 30m	7 d 30m	10 d	Deg. Min.	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	Point	h m	h m	h m	h m	h m	h m
South	12	12	12	12	North	12	12	12	12	12	12
s by w	.007	0.05	0.03	0.01	n by w	0 01	0.03	0.05	0.07	0.09	0.11
s s w	0.14	0.10	0.06	0 02	n n w	0.02	0 07	0.11	0.16	0.20	0.22
sw by s	0.22	0.16	0.09	0.03	nwbyn	0 04	0.11	0.18	0.26	0.32	0.37
s w	0.34	0.24	0.14	0 04	n w	0.06	0.17	0.28	0.39	0.49	0.56
sw by w	0.50	0 35	0.21	0.06	nwb w	0.09	0.25	0.42	1.00	1.15	1.28
w s w	1.17	0.56	0.33	0.10	w n w	0.15	0.41	1.12	1.47	2.23	2.59
w by s	2 19	1.43	1.03	0.20	w by n	0.33	1.55				
West	5 08	4.13	3.09	1.40							
⊙ set	6.02	6.04	6 06	6.08	⊙ set	6.10	6.12	6.14	6 16	6.18	6.19
Sun's Ampl.	d m	d m	d m	d m	Sun's Amp.	d m	d m	d m	d m	d m	d m
	2.32	5.05	7.38	10.11		12.44	15.17	17.50	20.24	22.27	23.59

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
North	12	12	12	12	12	12	12	12	12	12	12
s by w	0.09	0.11	0.13	0 15	0.17	0 19	0.21	0.23	0.25	0.27	0.28
s s w	0.18	0.22	0.26	0.30	0.34	0.39	0.43	0.47	0.52	0.56	0.59
sw by s	0.29	0.36	0.42	0.49	0.55	1.02	1.09	1.16	1.24	1.30	1.35
s w	0.43	0.53	1.03	1.12	1.22	1.33	1.43	1.54	2.05	2.15	2.22
sw by w	1.04	1.18	1.32	1.47	2.01	2 17	2.33	2.49	3.07	3.23	3.35
w s w	1.39	2.01	2.22	2 45	3.08	3.33	4.00	4.30	5.05	5.41	
w by s	2.55	3.31	4.08	4.47	5.31						
West	6.00										
⊙ set	6.00	5.58	5.56	5.54	5.52	5.50	5.48	5.46	5 44	5.42	5.41

A Sun-Dial for the Latitude of 12 Degrees.

NORTH DECLINATION.

Deg. Min.	2 d 30m	5 d	7 d 30m	10 d	Deg. Min.	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	Point	h m	h m	h m	h m	h m	h m
South	12	12	12	12	North	12	12	12	12	12	12
s by w	0.07	0.06	0.04	0.02	n by w	0.00	0.02	0.04	0.07	0.09	0.10
s s w	0.16	0.12	0.08	0.04	n n w	0.01	0.05	0.10	0.14	0.18	0.21
sw by s	0.25	0.19	0.12	0.05	nw by n	0.01	0.08	0.15	0.23	0.29	0.34
s w	0.37	0.28	0.18	0.08	n w	0.02	0.12	0.23	0.35	0.44	0.51
sw by w	0.55	0.41	0.27	0.12	nw by w	0.03	0.19	0.35	0.53	1.09	1.21
w s w	1.25	1.04	0.42	0.19	w n w	0.05	0.31	1.00	1.34	2.07	2.40
w by s	2.31	1.56	1.19	0.38	w by n	0.11	1.17				
West	5.12	4.23	3.27	2.16							
☉ set	6.02	6.04	6.06	6.09	☉ set	6.11	6.13	6.15	6.18	6.20	6.21
Sun's	d m	d m	d m	d m	Sun's	d m	d m	d m	d m	d m	d m
Ampl.	2.33	5.07	7.40	10.13	Amp.	12.48	15.20	17.54	20.28	22.31	24.5

SOUTH DECLINATION

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.09	0.11	0.13	0.15	0.17	0.19	0.21	0.23	0.25	0.27	0.29
s s w	0.20	0.24	0.28	0.32	0.36	0.40	0.44	0.49	0.53	1.57	1.00
sw by s	0.32	0.38	0.45	0.51	0.58	1.05	1.12	1.19	1.26	1.32	1.37
s w	1.47	0.56	1.06	1.16	1.26	1.36	1.46	1.57	2.08	2.18	2.25
sw by w	1.09	1.23	1.37	1.52	2.06	2.21	2.37	2.53	3.11	3.27	3.39
w s w	1.47	2.07	2.29	2.51	3.14	3.38	4.04	4.33	5.07	5.41	
w by s	3.05	3.39	4.14	4.51	5.32						
West	6.00										
☉ set	6.00	5.58	5.56	5.54	5.51	5.49	5.47	5.45	5.42	5.40	5.39

A Sun-Dial for the Latitude of 13 Degrees

NORTH DECLINATION.

Deg. Min.	2 d	5 d 30m	7 d 30m	10 d	12 d 30m	Deg. Min.	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	Point	h m	h m	h m	h m	h m
South	12	12	12	12	12	North	12	12	12	12	12
s by w	0.08	0.06	0.04	0.02	0.00	n by w	0.02	0.04	0.06	0.08	0.09
s s w	0.17	0.13	0.09	0.05	0.01	n n w	0 03	0.08	0.12	0.16	0.19
sw by s	0.28	0.21	0.15	0.08	0 01	nwbyn	0.06	0.13	0.20	0.26	0.31
s w	0.41	0.31	0.22	0 12	0.02	n w	0.08	0.19	0.30	0.40	0.47
sw by w	1.01	0.47	0.32	0.18	0.03	nwb w	0.13	0.29	0 46	1.01	1.13
w s w	1.33	1.12	0.51	0.28	0.05	w n w	0.21	0.49	1.21	1.52	2.22
w by s	2 41	2.08	1.33	0.54	0.10	w by n	0.48				
West	5 10	4.31	3.41	2.41	1.05						
☉ set	6.02	6.05	6 07	6.09	6.11	☉ set	6.14	6.16	6 19	6.21	6.23
Sun's Ampl.	d m	d m	d m	d m	d m	Sun's Amp.	d m	d m	d m	d m	d m
	2.34	5.08	7.42	10.16	12.49		15.24	17.59	20.33	22.37	24.13

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
North	12	12	12	12	12	12	12	12	12	12	12
s by w	0.10	0.12	0.14	0 16	0.18	0 20	0.22	0.24	0.26	0.28	0.29
s s w	0.21	0.25	0.29	0.33	0.38	0.42	0.46	0.50	0.55	0.59	1.02
sw by s	0.34	0.41	0.47	0.54	1.00	1.07	1.14	1.21	1.28	1.34	1.39
s w	0.51	1.00	1.10	1.19	1.29	1.39	1.50	2.01	2.12	2.21	2.29
sw by w	1.14	1.28	1.42	1.56	2.11	2 26	2.41	2.58	3.15	3.30	3.42
w s w	1.54	2.15	2.36	2 57	3.20	3.43	4.08	4.37	5.09	5.40	
w by s	3.14	3.47	4.20	4.55	5.34						
West	6.00										
☉ set	6.00	5.58	5.55	5.53	5.51	5.49	5.46	5.44	5.41	5.39	5.37

A Sun-Dial for the Latitude of 14 Degrees.

NORTH DECLINATION.

Deg. Min	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	Deg. Min.	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	Point	h m	h m	h m	h m	h m
South	12	12	12	12	12	North	12	12	12	12	12
s by w	0.09	0.07	0.05	0.03	0.01	n by w	0.01	0.03	0.05	0.07	0.08
s s w	0.19	0.15	0.11	0.07	0.03	n n w	0.02	0.06	0.10	0.14	0.17
sw by s	0.30	0.24	0.17	0.11	0.04	nw byn	0.03	0.10	0.17	0.23	0.28
s w	0.45	0.35	0.26	0.16	0.06	n w	0.04	0.15	0.26	0.35	0.43
sw by w	1.06	0.52	0.38	0.24	0.09	nwbyw	0.06	0.22	0.40	0.54	1.06
w s w	1.41	1.20	0.59	0.38	0.15	w n w	0.10	0.37	1.08	1.38	2.05
w by s	2.52	2.19	1.46	1.10	0.29	w byn	0.22	1.48			
West	3.19	4.38	3.53	3.00	1.49	West					
☉ set	6.02	6.05	6.07	6.10	6.12	☉ set	6.15	6.18	6.21	6.23	6.25
Sun's Ampl.	d m 2.34	d m 5.09	d m 7.44	d m 10.19	d m 12.53	Sun's Amp.	d m 15.28	d m 18.3	d m 20.38	d m 22.43	d m 24.16

SOUTH DECLINATION

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.11	0.13	0.15	0.17	0.19	0.21	0.23	0.25	0.27	0.29	0.30
s s w	0.23	0.27	0.31	0.35	0.39	0.44	0.48	0.52	0.57	1.01	1.03
sw by s	0.37	0.43	0.50	0.56	1.03	1.10	1.16	1.23	1.31	1.36	1.41
s w	0.54	1.04	1.13	1.23	1.33	1.43	1.53	2.04	2.15	2.24	2.31
sw by w	1.20	1.33	1.47	2.01	2.15	2.30	2.45	3.02	3.19	3.33	3.45
w s w	2.01	2.21	2.42	3.03	3.25	3.48	4.12	4.40	5.11		
w by s	3.22	3.53	4.25	4.59	5.35						
West	6.00										
☉ set	6.00	5.58	5.55	5.53	5.50	5.48	5.45	5.42	5.39	5.37	5.35

A Sun-Dial for the Latitude of 15 Degrees.

NORTH DECLINATION.

Deg. Min.	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	Deg. Min.	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	Point	h m	h m	h m	h m	h m
South	12	12	12	12	12	North	12	12	12	12	12
s by w	0.10	0.08	0.06	0.04	0.02	n by w	Zen. West.	0.02	0.04	0.06	0.07
s s w	0.21	0.16	0.12	0.08	0.04	n n w		0.04	0.09	0.12	0.15
sw by s	0.33	0.26	0.20	0.13	0.07	nw by n		0.17	0.14	0.20	0.25
s w	0.49	0.39	0.30	0.20	0.10	n w		0.11	0.22	0.31	0.38
sw by w	1.11	0.58	0,44	0.30	0.15	nw byw		0.16	0.33	0.47	0.59
w s w	1.48	1.28	1.08	0.47	0.24	w n w		0.26	0.56	1.24	3.50
w by s	3.00	2 30	1.58	1.24	0·46	w by n		1.06			
West	5.22	4.44	4.02	3.15	2.17						
☉ set	6.02	6.05	6.08	6.11	6.13	☉ set	6.16	6.19	6.22	6.25	6.27
Sun's Amp.	d m 2.35	d m 5.10	d m 7.46	d m 10.21	d m 12.56	Sun's Ampl.	d m 15.32	d m 18.8	d m 20.44	d m 22.49	d m 24.24

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.12	0.14	0.16	0.18	0.20	0.22	0.24	0.26	0.28	0.30	0.31
s s w	0.24	0.28	0.32	0.36	0.40	0.45	0.49	0.53	0.58	1.02	1.04
sw by s	0.39	0.46	0.52	0.59	1.05	1.12	1.18	1.25	1.33	1.39	1.43
s w	0.58	1.07	1.17	1.26	1.36	1.46	1.56	2.07	2.18	2.27	2.34
sw byw	1.25	1.38	1.52	2.06	2.20	2.34	2.49	3.05	3.22	3.37	3.48
w s w	2.08	2.28	2.48	3.08	3.29	3.52	4.16	4.42	5.12		
w by s	3.30	4.00	4.30	5.02	5.36						
West	6.00										
☉ set	6.00	5.58	5.55	5.52	5.49	5.47	5.44	5.41	5.38	5.35	5.33

A Sun-Dial for the Latitude of 16 Degrees.

NORTH DECLINATION.

Deg. Min.	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	Deg. Min.	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	Point	h m	h m	h m	h m
South	12	12	12	12	12	12	North	12	12	12	12
s by w	0.11	0.09	0.07	0 05	0.03	0.01	n by w	0,01	0.03	0.05	0.07
s s ws	0.22	0.18	0.14	0.10	0.06	0.02	n n w	0.03	0.07	0.11	0.14
sw by s	0 35	0.29	0.23	0.16	0.10	0.03	nw b n	0.04	0.11	0.17	0.22
s w	0.52	0.43	0.34	0.2[illegible]	0 14	0.04	n w	0.06	0.17	0.26	0.33
swby w	1.16	1.03	0 49	0.35	0.21	0.06	nwb w	0.10	0.26	0.40	0.52
w by w	2.55	1.36	1.10	0.55	0.33	0.10	w n w	0.16	0.44	1.11	1.34
w by s	3.08	2.39	2.09	1.37	1.02	0.20	w by n	0,36			
West	5.25	4.49	4.11	3.28	2.37	1.23					
⊙ set	6.03	6.06	6.09	6.12	6.15	6.18	⊙ set	6.21	6.24	6.27	6.29
Sun's Ampl.	d m 2.36	d m 5.12	d m 7.48	d m 10.24	d m 13.0	d m 15.37	Sum's Ampl.	d m 18.13	d m 23.51	d m 22.56	d m 24.32

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.13	0.14	0.16	0.18	0.20	0.22	0.24	0.26	0.28	0.30	0.33
s s w	0.26	0.30	0.34	0.38	0.42	0.46	0.50	0.55	0.59	1.03	1.06
sw by s	0.42	0.48	0.54	1.01	1.07	1.14	1.21	1.28	1.35	1.41	1.45
s w	1.02	1.11	1.20	1.29	1.39	1.49	1.59	2.10	2.21	2.30	2.37
sw by w	1.30	1.43	1.56	2.10	2.24	2.38	2.53	3.09	3.25	3.40	3.51
w s w	2.15	2.34	2.54	3.14	3.34	3.56	4.19	4.45	5.13		
w by s	3 37	4.05	4.34	5.04	5.36						
West	6.00										
⊙ set	6.00	5.57	5.54	5.51	5 48	5.45	5.42	5.39	5.36	5.33	5.31

A Sun-Dial for the Latitude of 17 Degrees.

NORTH DECLINATION.

Deg. Min.	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	Deg. Min.	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	Point	h m	h m	h m	h m
South	12	12	12	12	12	12	North	12	12	12	12
s by w	0.11	0.09	0 07	0.06	0.04	0.02	n by w	0.00	0.02	0 04	0.06
s s ws	0.24	0 20	0.16	0.12	0.08	0.03	n n w	0.01	0.05	0.09	0.12
sw by s	0 38	0.32	0.25	0.19	0.13	0.06	nw byn	0.01	0.08	0.15	0.19
s w	0.56	0.47	0.38	0 28	0.18	0.08	n w	0.02	0 13	0 22	0.29
sw by w	1.21	1.08	0.55	0.41	0.27	0.12	nwbyw	0 03	0.19	0.33	0 45
w s w	2.02	1.43	1.23	1.03	0.42	0.19	w n w	0.05	0.33	0.58	1.20
w by s	3.16	2.48	2.20	1.45	1.16	0.37	w by n	0.11	1.36		
West	5.27	4.53	4.18	3.39	2.54	1.55					
w by n					5.50	5.11					
⊙ set	6.03	6.06	6.09	6.12	6.15	6.19	⊙ set	6.22	6.25	6.28	6.31
Sun's Ampl.	d m 2.36	d m 5.13	d m 7.50	d m 10.28	d m 13.04	d m 15.42	Sun's Amp.	d m 18.19	d m 20.57	d m [illegible]4.4	d m 24.40

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.13	0.15	0.17	0.19	0.21	0 23	0 25	0.27	0.29	0.31	0.33
s s w	0.28	0.32	0.36	0.39	0.43	0.47	0.52	0.56	1.01	1.04	1.07
sw by s	0.44	0.50	0.57	1.03	1.09	1.16	1.23	1.30	1.37	1.4[illegible]	1 47
s w	1.05	1.14	1.24	1.33	1.42	1.51	2.02	2.13	2.2[illegible]	2 32	2.39
sw by w	1.35	1.48	2.01	2.14	2 28	2.42	2.57	3.12	3.29	3.4[illegible]	3.54
w s w	2.21	2.40	2.59	3.18	3.39	4.0[illegible]	4.22	4.47	5.14		
w by s	3.43	4.10	4.38	5.07	5.37						
West	6.00										
⊙ set	6.00	5.57	5.54	5.51	5.48	5.45	5.34	5 38	5.35	5.32	5.2[illegible]

A Sun-Dial for the Latitude of 18 Degrees.

NORTH DECLINATION.

Deg. Min.	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	Deg. Min.	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	Point	h m	h m	h m
South	12	12	12	12	12	12	12	North	12	12	12
s by w	0.12	0 10	0.08	0.06	0.04	0.02	0,00	n by w	0.02	0.03	0.05
s s ws	0.25	0.21	0.17	0.13	0.09	0.05	0.01	n n w	0 04	0.07	0.10
sw by s	0.40	0.34	0.28	0.21	0,15	0.09	0.01	nw b n	0.06	0.12	0.16
s w	1.00	0.50	0.41	0.32	0.22	0.12	0.02	n w	0.09	0.17	0.24
swby w	1.26	1.13	1.00	0.47	0.32	0.18	0.03	nwb w	0.13	0.27	0.38
w by w	2.08	1.50	1.31	1.11	0.51	0.29	0.05	w n w	0.21	0.45	1.06
w by s	3.23	2.57	2.29	2.00	1.29	0.53	0.10	w by n	0.53		
Weſt	5.29	4.57	4.24	3.49	3.08	2.18	0 56	Weſt			
wby n					5.51	5.15	4.32				
⊙ ſet	6.03	6.06	6.09	6.13	6.16	6.20	6.23	⊙ ſet	6.27	6.30	6.33
Sun's Ampl.	d m 2.37	d m 5.15	d m 7.53	d m 10.31	d m 13.9	d m 15.47	d m 18.26	Sum's Ampl.	d m 21.4	d m 23.12	d m 24.49

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.14	0.16	0.18	0.20	0.22	0.24	0.26	0.28	0.30	0.32	0.33
s s w	0.29	0.33	0.37	0.41	0.45	0.49	0.53	0.58	1.02	1.06	1.08
sw by s	0.47	0.53	0.59	1.05	1.12	1.18	1.25	1.32	1.39	1.45	1.49
s w	1.09	1.18	1.27	1.36	1.46	1.55	2.05	2.15	2.26	2.35	2.42
sw by w	1.39	1.52	2.05	2.18	2.32	2.45	3.00	3.15	3.31	3.45	3.56
w s w	2.17	2 45	3.04	3.23	3.43	4.03	4.25	4.49	5.15		
w by s	3 49	4.15	4.41	5.09	5.38						
Weſt	6.00										
⊙ ſet	6.00	5.57	5.54	5.51	5 47	5.44	5.40	5.37	5.33	5.30	5.27

A Sun-Dial for the Latitude of 19 Degrees.

NORTH DECLINATION.

Deg. Min.	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	Deg. Min.	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	Point	h m	h m	h m
South	12	12	12	12	12	22	12	North	12	12	12
s by w	0.13	0.11	0 09	0.07	0,05	0.03	0.01	n by w	0,01	0.03	0.04
s s w	0,27	0.23	0.19	0.15	0.11	0.07	0.03	n n w	0.02	0.05	0.08
sw by s	0.43	0.37	0.30	0.24	0.18	0,11	0.05	nwy bn	0.03	0.09	0.13
s w	1.03	0.54	0.45	0.36	0,26	0.17	0.07	n w	0.04	0.13	0.20
sw byw	1.31	1.18	1.05	0.52	0.38	0,24	.009	nwbyw	0.06	0.20	0.31
w s w	2.15	1.57	1.38	1.19	0.59	0.37	0.15	w n w	0.10	0.33	0.53
w by s	3.30	3.04	2.38	2.11	1.41	1.08	0 29	w by n	0.23		
West	5.31	5.01	4.30	3.57	3. 20	2 36	1.35				
w by n					5.52	5.19	4.40				
☉ set	6.03	6.07	6.10	6.14	6.17	6,21	6.25	☉ set	6.28	6.31	6.34
Sun's Ampl.	d m 2.38	d m 5.17	d m 7.56	d m 10.35	d m 13.14	d m 15.53	d m 18.33	Sun's Amp	d m 21.12	d m 23.20	d m 24.58

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	29 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.15	0.17	0.19	0.21	0.23	0.25	0.27	0.29	0 30	0.32	0.34
s s w	0.31	0.35	0.38	0.42	0.46	0.50	0.54	0.59	1.03	1.07	1.09
sw by s	0.49	0.55	1.01	1.08	1.14	1.21	1.27	1.34	1.41	1.47	1.51
s w	1.12	1.21	1.30	1.39	1.48	1.58	2.07	2.18	2.29	2.37	2.44
sw by w	1.44	1.57	2.09	2.23	2.36	2.49	3.04	3.19	3.34	3.48	3.58
w s w	2.33	2.51	3.09	3.27	3.46	4.06	4.28	4.51	5.16		
w by s	3.54	4.19	4.44	5.10	5.39						
West	6.00										
☉ set	6.00	5.57	5.53	5.50	5.46	5.43	5,39	3,35	3.32	5.29	5.26

A Sun-Dial for the Latitude of 20 Degrees.

NORTH DECLINATION.

Deg. Min.	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	Deg. Min.	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	Point	h m	h m	h m
South	12	12	12	12	12	12	12	North	12	12	12
s by w	0.14	0.12	0.10	0.08	0.06	0.04	0.02	n by w	Zen. West.	0.02	0.03
s s w	0.28	0.25	0.21	0.17	0.13	0.09	0.05	n n w		0.04	0.06
sw by s	0.45	0.39	0.32	0.26	0.20	0.14	0.07	nw by n		0.06	0.10
s w	1.07	0.58	0.49	0.40	0.30	0.21	0.11	n w		0.09	0.16
sw by w	1.36	1.23	1.10	1.58	0.44	0.30	0.15	nwbyw		0.13	0.24
w s w	2.21	2.03	1.45	1.26	1.07	0.46	0.24	w n w		0.22	0.40
w by s	3.36	3.11	2.45	2.20	1.52	1.21	0.45				
West	5.32	5.04	4.35	4.04	3.30	2.50	2.00				
w by n					5.54	5.23	4.47				
☉ set	6.03	6.07	6.11	6.15	6.18	6.22	6.26	☉ set	6.30	6.33	6.36
Sun's Ampl.	d m	d m	d m	d m	d m	d m	d m	Sun's Amp.	d m	d m	d m
	2.40	5.19	7.59	10.39	13.19	16.0	18.40		21.20	23.29	25.8

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.16	0.17	0.19	0.21	0.23	0.25	0.27	0.29	0.31	0.33	0.34
s s w	0.32	0.36	0.40	0.44	0.48	0.52	0.56	1.00	1.05	1.08	1.11
sw by s	0.51	0.58	1.04	1.10	1.16	1.23	1.29	1.36	1.43	1.49	1.53
s w	1.16	1.24	1.33	1.42	1.51	2.01	2.10	2.20	2.31	2.40	2.47
sw by w	1.48	2.01	2.14	2.26	2.39	2.53	3.07	3.22	3.37	3.50	4.00
w s w	2.38	2.56	3.13	3.31	3.50	4.09	4.30	4.52	5.16		
w by s	3.59	4.23	4.47	5.12	5.39						
West	6.00										
☉ set	6.00	5.57	5.53	5.49	5.45	5.42	5.38	5.34	5.30	5.27	5.24

A Sun-Dial for the Latitude of 21 Degrees.

NORTH DECLINATION.

Deg. Min	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	Deg. Min.	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	Point	h m	h m
South	12	12	12	12	12	22	12	12	North	12	12
s by w	0.14	0.13	0 11	0.09	0.07	0.05	0.03	0,01	n by w	0.01	0.02
s s w	0,30	0.26	0.22	0.18	0.14	0.10	0.06	0.02	n n w	0.02	0.04
sw by s	0.48	0.42	0.35	0.29	0.23	0.16	0.10	0.03	nwy bn	0.03	0.07
s w	1.10	1.01	0.52	0.43	0.34	0 24	0.15	0.04	n w	0.04	0.11
sw byw	1.40	1.28	1.15	1.03	0.49	0.36	0.21	0.06	nwbyw	0.06	0 17
w s w	2.36	2.09	1.52	1.34	1.15	0.55	0.33	0.10	w n w	0.11	0.28
w by s	3.41	3.18	2.54	2.29	2.03	1 33	1.06	0.20	w by n	0.24	
Weſt	5 34	5.07	4.40	4.11	3.39	3 03	2.19	1.14			
w by n					5.55	5.26	4.53	4.12			
☉ ſet	6.04	6.08	6.12	6.16	6.20	6.24	6.28	6.32	☉ ſet	6.35	6.38
Sun's Ampl.	d m 2.41	d m 5 21	d m 8.02	d m 10.43	d m 13.24	d m 16.6	d m 18.47	d m 21.29	Sun's Amp	d m 23.39	d m 25.18

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	29 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.16	0.18	0.20	0.22	0.24	0.26	0.28	0.30	0.32	0.34	0.35
s s w	0.34	0.38	0.42	0.45	0.49	0.54	1.58	1.02	1.06	1.10	1.12
sw by s	0.54	1.00	1.06	1.12	1.19	1.25	1.32	1.38	1.45	1.51	1.55
s w	1.19	1.28	1.37	1.46	1.34	2.04	2.13	2.23	2.33	2.42	2.49
sw by w	1.53	2.05	2.18	2.30	2.43	2.56	3.10	3 24	3.39	3.52	4.02
w s w	2.43	3.01	3.18	3.35	3.54	4.12	4.32	5.53	5.17		
w by s	4.04	4.27	4.50	5.14	5.39						
Weſt	6.00										
☉ ſet	6.00	5.56	5.52	5.48	5.44	5.40	5,36	5,32	5.28	5.25	5.22

A Sun-Dial for the Latitude of 22 Degrees.

NORTH DECLINATION.

Deg. Min.	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	Deg. Min.	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	Point	h m	h m
South	12	12	12	12	12	12	12	12	North	12	12
s by w	0.15	0.13	0.11	0.09	0.08	0.06	0.04	0.02	n by w	Zen. Weſt.	0.01
s s w	0.31	0.28	0.24	0.20	0.16	0.12	0.08	0.04	n n w		0.03
sw by s	0.50	0.44	0.38	0.32	0.25	0.19	0.13	0.06	nw by n		0.04
s w	1.14	1.05	0.56	0.47	0.38	0.29	0.19	0.08	n w		0.07
sw by w	1.45	1.33	1.20	1.08	0.55	0.41	0.27	0.13	nwbyw		0.10
w s w	2.32	2.15	1.58	1.40	1.22	1.03	0.42	0.20	w n w		0.17
w by s	3.46	3.24	3.01	2.38	2.12	1.45	1.14	0.37			
Weſt	5.35	5.10	4.44	4.17	3.47	3.14	2.35	1.43			
w by n					5.56	5.28	4.58	4.21			
☉ ſet	6.04	6.08	6.12	5.16	6.21	6.25	6.29	6.34	☉ ſet	6.37	6.40
Sun's Ampl.	d m 2.42	d m 5.23	d m 8 05	d m 10.48	d m 13.30	d m 16.13	d m 18.55	d m 21.39	Sun's Amp.	d m 23.50	d m 25.29

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.17	0.19	0 21	0 23	0.25	0.27	0.28	0.30	0.32	0.34	0.35
s s w	0.35	0.39	0.43	0.47	0.50	0.55	0.59	1.03	1.07	1.11	1.13
sw by s	0.56	1.02	1.08	1.14	1.21	1.27	1.33	1.40	1.47	1.52	1.57
s w	1.22	1.31	1.40	1.49	1.58	2.07	2.16	2.25	2.36	2.44	2.51
sw by w	1.57	2.09	2.21	2.34	2 46	2.59	3.13	3.27	3.42	3.54	4.04
w s w	2.49	3.05	3.22	3.39	3.57	4.15	4.34	4.55	5.17		
w by s	4.08	4.30	4.52	5.15	5.39						
Weſt	6.00										
☉ ſet	6.00	5.56	5.52	5.48	5.44	5.39	5.35	5.31	5.26	5.23	5.20

A Sun-Dial for the Latitude of 23 Degrees.

NORTH DECLINATION.

Deg. Min.	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	Deg. Min.	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	Point	h m
South	12	12	12	12	12	12	12	12	12	North	12
s by w	0.16	0.14	0.12	0.11	0.09	0.07	0.05	0.03	0 01	n by w	0.00
s s ws	0.33	0.30	0.26	0.22	0.18	0.14	0.10	0.05	0.02	n n w	0.01
sw by s	0 53	0.47	0.41	0.34	0.28	0.22	0.16	0.09	0.03	nw byn	0.01
s w	1.17	1.08	1.00	0 50	0.41	0.32	0.23	0.13	0 04	n w	0.02
sw by w	1.49	1.37	1.25	1.13	0.00	0.47	0.33	0.19	0.06	nwbyw	0 03
w s w	2.37	2.21	2.04	1.47	1.29	1.11	0.51	0.29	0.10	w n w	0.06
w by s	3.51	3.30	3.08	2.45	2.21	1.55	1.26	0.54	0.2c		
West	5.36	5.12	4.48	4.22	3.54	3.23	2.48	2.04	1.11		
w by n				6.21	5.57	5.31	4 02	4.29	3.56		
☉ set	6.04	6.09	6.13	6.17	6.22	6.26	6.31	6.36	6.39	☉ set	6.42
Sun's Ampl.	d m 2.42	d m 5.26	d m 8.10	d m 10.52	d m 13.36	d m 16.20	d m 19.4	d m 21.49	d m 24.1	Sun's Amp.	d m 25.41

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.18	0.20	0.22	0.24	0.26	0.28	0.29	0.31	0.33	0.35	0.36
s s w	0.37	0.41	0.44	0.48	0.51	0.56	1.00	1.04	1.08	1.12	1.15
sw by s	0.59	1.04	1.10	1.16	1.23	1.29	1.35	1.42	1.49	1.54	1 59
s w	1.25	1.34	1.43	1.51	2.01	2.10	2.19	2.28	2.38	2 46	2.53
sw by w	2.01	2.13	2.25	2.37	2.50	3.02	3.16	3.29	3.44	3.56	4.06
w s w	2.53	3.10	3.26	3.43	4 00	4.17	4.36	4.56	5.17		
w by s	4.12	4.33	4.54	5.16	5.39						
West	6.00										
☉ set	6.00	5.56	5.51	5.47	5.43	5.38	5.34	5.29	5.24	5.21	5.18

A Sun-Dial for the Latitude of 24 Degrees.

NORTH DECLINATION.

Min. Deg.	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	m h	h m
South	12	12	12	12	12	12	12	12	12	12
s by w	0.17	0.15	0.13	0.11	0.09	0 08	0.06	0.04	0 02	0.00
s s w	0.35	0.31	0.27	0.23	0.19	0.15	0.11	0.07	0,04	0 01
sw by s	0.55	0.49	0.43	0.37	0 3[illegible]	0.24	0 18	0.11	0.06	0 01
s w	1.20	1.12	1.03	0.53	0.44	0.35	0.27	0.17	0.09	0.02
sw by w	1.54	1.42	1.30	1.18	1.05	0.52	0.39	0 24	0.13	0.03
w s w	2.42	2.26	2.10	1.53	1.36	1.18	0.59	0.38	0.20	0.05
w by s	3.56	3.35	3.14	2,52	2.29	2.05	1.38	1.07	0.38	0.10
West	5.37	5.15	4.51	4.27	4.01	3.32	3.00	2.21	1.39	0.50
w by n				6.21	5.58	5.33	5.06	4.35	4 06 6.24	3.39 6,09
☉ set	6.04	6.09	6.13	6.18	6.23	6.27	6.32	6.37	6.41	6.44
Sun's Ampl.	d m 2.44	d m 5.28	d m 8.13	d m 10.57	d m 13.42	d m 16.27	d m 19,13	d m 21.59	d m 24.12	d m 25.54

SOUTH DECLINATION

Deg. Mim.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.18	0.20	0.22	0.24	0.26	0.28	0.29	0.31	0.33	0.35	0.37
s s w	0.38	0.42	0.46	0.50	0.53	0.57	1.01	1.05	1.10	1.13	1.16
sw by s	1.01	1.07	1.13	1.19	1.25	1.31	1.37	1.44	1.50	1.56	2.00
s w	1.29	1.37	1.46	1.54	2.40	2.13	2.21	2.31	2.40	2.48	2.55
sw by w	2.05	2.17	2.29	2.41	2.53	3.05	3.18	3 32	3.46	3.58	4.08
w s w	2.58	3.14	3.30	3.46	4.02	4 20	4.38	4 57	5.18		
w by s	4.16	4.36	4.56	4.17	5 39						
West	6.00										
☉ set	6.00	5.56	5.51	5.47	5.42	5.37	5.33	5.28	5.23	5.19	5.16

A Sun-Dial for the Latitude of 25 Degrees

NORTH DECLINATION.

Deg. Min.	0 d	2 d	5 d 30m	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.19	0.17	0.16	0.14	0.12	0.10	0.08	0.06	0.04	0.00	0.01
s s w	0.40	0.36	0.32	0.29	0.25	0.21	0.17	0.13	0.09	0.05	0.03
sw by s	1.03	0.57	0.51	0.45	0.39	0.33	0.27	0.21	0.14	0.09	0.04
s w	1.32	1.23	1.15	1.06	0.57	0.49	0.40	0.31	0.21	0.13	0.06
sw by w	2.09	1.58	1.46	1.35	1.22	1.10	0.58	0.44	0.31	0.19	0.10
w s w	3.02	2.47	2.32	2.16	2.00	1.43	1,25	1.07	0.47	0.29	0,15
w by s	4.19	4.00	3.40	3.20	2.59	2.37	2.14	1.48	1.19	0.53	0.29
Weſt	6.00	5.38	4.17	4.54	4.31	4.06	3.40	3.10	2.35	2.00	1.24
w by n					6.21	5.59	5.36	5.10	4.41	4.14	3.50
w n w										6.25	6.10
☉ ſet	6.00	6.05	6.09	6.14	6.19	6.24	6.29	6.34	6.39	6.43	6.47
Sun's Ampl.	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
	0.00	2.45	5.31	8.16	11.3	13.49	16.35	19.22	22.10	24.24	26,8

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
North	12	12	12	12	12	12	12	12	12	12	12
s by w	0.19	0.21	0.23	0.25	0.27	0.28	0.30	0.32	0.34	0.36	0.37
s s w	0.40	0.43	0.47	0.51	0.55	0.59	1.02	1.06	1.10	1.14	1.17
sw by s	1.03	1.09	1.15	1.21	1.27	1.33	1.39	1.46	1.52	1.58	2.02
s w	1.32	1.40	1.48	1.57	2.06	2.15	2.23	2.33	2.42	2.50	2.57
sw by w	2.09	2.21	2,33	2.44	2.56	3.08	3.21	3.34	3.48	4.00	4.09
w s w	3.02	3.18	3.33	3.49	4.05	4.22	4.39	4.58	5.19		
w by s	4.19	4.39	4.58	5.18	5.39						
Weſt	6.00										
☉ ſet	6.00	5.55	5.51	5.46	5.41	5.36	5.31	5.26	5.21	5.17	5.17

A Sun-Dial for the Latitude of 26 Degrees.

NORTH DECLINATION.

Deg. Min	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.20	0.18	0.16	0.14	0.13	0.11	0 09	0.07	0.05	0.03	0.02
s s w	0 41	0 38	0.34	0.30	0.26	0.2[illegible]	0.19	0.15	0.11	0.07	0 04
swby s	1.05	0.59	0.54	0.48	0.42	0.36	0.30	0.24	0.17	0.11	0 07
s w	1.35	1.26	1.18	1.10	1.01	0.52	0 43	0.34	0.25	0 17	0.11
sw by w	2.13	2.02	1.50	1.39	1.27	1.15	1.03	0.50	0.36	0.25	0.16
w s w	3.07	3.52	2.37	2.21	2.06	1.49	1.32	1.14	0.55	0.38	0.25
w by s	4.22	4.04	3.45	3.25	3.06	2.46	3.23	1.58	1.31	1.07	0.45
West	6.00	5.39	5.19	4.57	4.35	4.12	3.47	3.19	2.47	2.16	1 47
w by n					6.21	6.00	5.38	5.13	4.40	4.22	4.00
w n w									6 42	6.25	6.12
☉ set	6.00	6 05	6.10	6.15	6 20	6.25	6.30	6 35	6.41	6.45	6.49
Sun's Ampl.	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
	0.00	2.46	5.33	8.21	11 8	13.56	16.44	19.33	22.22	24.37	26.23

SOUTH DECLINATION

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.20	0.22	0.24	0.25	0.27	0.29	0.31	0.33	0 35	0.36	0.38
s s w	0.41	0 45	0.49	0.57	0 56	1 00	1.04	1.08	1.12	1.15	1.18
sw by s	1.05	1.11	1.17	1.23	1.29	1.35	1.41	1.47	1.54	1.59	2.03
s w	1 35	1.43	1 51	2.0	2.08	2.17	2.26	2.25	2.44	2 52	2.59
sw by w	2.13	2.24	2.36	2.47	2.59	3.11	3 23	3.36	3.50	4.01	4.10
w s w	3.07	3.21	3.37	3.52	4.08	4 24	4.41	4.59	5.18		
w by s	4.22	4 41	5.00	5.19	5.39						
West	6 00										
☉ set	6.00	5.55	5 50	5.45	5.40	5 3[illegible]	5.30	5.25	5.19	5.15	5.11

A Sun-Dial for the Latitude of 27 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	22	12	12	12	12
s by w	0.21	0.19	0.17	0 15	0.13	0.12	0.10	0.08	0,06	0.04	0.03
s s w	0.43	0,39	0.35	0.32	0.28	0.24	0.20	0.17	0.12	0.09	0.06
sw by s	1.07	1.02	0.56	0.50	1.45	0.39	0.33	0.27	0.20	0.13	0.10
s w	1.38	1.30	1.21	1.13	1.05	0.55	0 47	0.38	0.29	0.21	0.15
sw byw	2.17	2.06	1.55	1.43	1.32	1.20	1.08	0.55	0.42	0.32	0 23
w s w	3.10	2.56	2.41	2 26	2.11	1.55	1.39	1.22	1.03	0.47	0.34
w by s	4.25	4.07	3.49	3.31	3.11	2.51	2 31	2.07	1 42	1.19	0.59
West	6.00	5.40	5.21	5.00	4.39	4.17	3 53	3.27	2.58	2.30	2.05
w by n					6.21	6.01	5.39	5.17	4.51	4.28	4.09
w n w									5.42	6.26	6.13
⊙ set	6.00	6.05	6.10	6.15	6.21	5.26	6.31	6.37	6.43	6.48	6.51
Sun's Ampl.	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
	0.00	2.48	5.37	8.25	11.14	14.03	16.53	9.43	22.54	24.51	26.37

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.21	0.22	0.24	0.26	0.28	0 30	0.32	0 34	0.35	0.37	0.38
s s w	0.43	0.46	0.50	0.53	0.57	1.01	1.0	1.09	1.13	1.16	1.19
sw by s	1.07	1.13	1.19	1.25	1.30	1.36	1.42	1.48	1.55	2.01	2.05
s w	1.38	1.46	1.54	2.02	2.11	2.19	2.28	2 37	2.46	2.54	3.00
w by w	2.17	2 28	2.39	2.50	3.02	3.13	3.26	3 38	3.52	4.02	4.10
w s w	3.10	3.25	3.40	3.54	4.10	4.25	4.42	4.59	5.18		
w by s	4.25	4.43	5.02	5.20	5.39						
West	6.00										
⊙ set	6.00	5.55	5.50	5.45	5.39	5.34	5,29	5,23	5.17	5.12	5.09

A Sun-Dial for the Latitude of 12 Degrees.

NORTH DECLINATION.

Deg. Min	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.21	0.20	0.18	0.16	0.14	0.13	0.11	0.09	0.07	0.05	0.04
s s w	0.44	0.40	0.37	0.33	0.30	0.26	0.22	0.18	0.14	0.11	0.08
swby s	1.10	1.04	0.58	0.53	0.47	0.41	0.35	0.29	0.22	0.16	0.13
s w	1.41	1.33	1.25	1.17	1.08	1.00	0.51	0.42	0.33	0.25	0.19
sw by w	2.20	2.10	1.59	1.48	1.36	1.25	1.13	1.01	0.48	0.37	0.28
w s w	3.14	3.00	2.46	2.31	2.17	2.01	1.45	1.28	1.11	0.55	0.43
w by s	4.28	4.11	3.53	3.36	3.17	2.58	2.38	2.16	1.52	1.31	1.13
West	6.00	5.41	5.22	5.03	4.43	4.21	3.59	3.35	3.07	2.42	2.20
w by n					6.21	6.02	5.41	5.20	4.56	4.34	4.16
w n w									6.42	6.27	6.14
☉ set	6.00	6.05	6.11	6.16	6.22	6.27	6.33	6.39	6.45	6.50	6.53
Sun's Ampl.	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
	0.00	2.50	5.40	8.30	11.21	14.11	17.3	10.51	22.48	25.6	26.52

SOUTH DECLINATION

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.21	0.23	0.25	0.27	0.28	0.30	0.32	0.34	0.36	0.38	0.39
s s w	0.44	0.48	0.51	0.55	0.58	1.02	1.06	1.10	1.14	1.17	1.20
sw by s	1.10	1.15	1.21	1.27	1.32	1.38	1.44	1.51	1.57	2.03	2.06
s w	1.41	1.49	1.57	2.05	2.13	2.21	2.30	2.39	2.47	2.56	3.02
sw by w	2.20	2.31	2.42	2.53	3.04	3.16	3.28	3.40	3.53	4.04	4.13
w s w	3.14	3.28	3.43	3.57	4.12	4.27	4.44	5.00	5.16		
w by s	4.28	4.45	5.03	5.21	5.39						
West	6.00										
☉ set	6.00	5.55	5.49	5.44	5.38	5.33	5.27	5.21	5.15	5.10	5.07

A Sun-Dial for the Latitude of 29 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.22	0.20	0.19	0.17	0.15	0.13	0.11	0.10	0.08	0.06	0.05
s s ws	0.45	0.42	0.38	0.35	0.31	0.27	0.23	0.19	0.16	0.12	0.10
sw by s	1.12	1.06	1.01	0.55	0.49	0.43	0.37	0.31	0.25	0.20	0.16
s w	1.43	1.36	1.28	1.20	1.12	1.03	0.55	0.46	0.37	0.29	0.23
sw by w	2.23	2.13	2.03	1.52	1.41	1.30	1.18	1.06	0.53	0.42	0.34
w s w	3.18	3.04	2.50	2.36	2.22	2.07	1.52	1.35	1.18	1.03	0.51
w by s	4.31	4.14	3.57	3.40	3.22	3.05	2.45	2.24	2.01	1.41	1.24
West	6.00	5.42	5.24	5.05	4.46	4.26	4.04	3.41	3.16	2.53	2.33
w by n					6.21	6.02	5.43	5.22	5.00	4.40	4.23
w n w									6.40	6.27	6.15
⊙ set	6.00	6.06	6.11	6.17	6.23	6.28	6.34	6.40	6.47	6.52	6.55
Sun's	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
Ampl	0.00	2.51	5.43	8.35	11.27	14.19	17.12	20.6	23.2	25.22	27.8

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.22	0.24	0.26	0.27	0.29	0.31	0.33	0.35	0.37	0.38	0.39
s s w	0.45	0.49	0.53	0.56	1.00	1.04	1.08	1.11	1.15	1.18	1.21
sw by s	1.12	1.17	1.23	1.29	1.34	1.4[illegible]	1.46	1.52	1.59	2.04	2.08
s w	1.43	1.51	1.59	2.07	2.15	2.24	2.32	2.41	2.49	2.58	3.04
sw by w	2.23	2.34	2.45	2.56	3.07	3.18	3.30	3.42	3.55	4.05	4.14
w s w	3.18	3.32	3.46	4.00	4.14	4.29	4.44	5.00			
w by s	4.31	4.48	5.04	5.22	5.39						
West	6.00										
⊙ set	6.00	5.54	5.49	5.43	5.37	5.32	5.26	5.20	5.13	5.08	5.05

A Sun-Dial for the Latitude of 30 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.23	0.21	0.19	0.18	0.16	0.14	0.12	0,10	0.08	0.07	0.06
s s ws	0 47	0.43	0.40	0.36	0.33	0.29	0.25	0.21	0.17	0.14	0.12
sw by s	1.14	1.08	1.03	0.58	0.52	0.46	0.40	0.34	0.28	0.23	0.19
s w	1.46	1.38	1 31	1.23	1.15	1.07	0.58	0.50	0.41	0.33	0.27
swby w	2.27	2.17	2.06	1.5[illegible]	1.45	1.34	1.23	1.11	0.58	0.48	0.40
w by w	3.21	3.08	2.55	2.4	2.27	2.13	1.58	1.42	1.25	1.11	0.59
w by s	4.33	4.17	4.01	3.44	3.27	3.10	2.51	2.31	2.10	1.51	1.35
West	6.00	5.43	5.25	5.07	4.49	4 30	4.09	3.48	3.24	3.02	2.44
w by n					6.21	6.03	5.45	5.25	5.03	4.45	4.29
w n w									6.42	6.28	6.17
☉ set	6.0[illegible]	6.06	6.12	6.18	6.2[illegible]	6.29	6.3[illegible]	6.42	6.48	6.54	6.58
Sun's	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
Ampl.	0.00	2.53	5.46	8.4[illegible]	11.34	14.28	17.23	20.18	23.16	25.38	27.25

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.23	0.24	0.26	0.28	0.30	0.31	0.33	0.35	0.37	0.39	0.40
s s w	0.47	0.50	0.54	1.57	1.01	1.05	1.09	1.12	1.16	1.19	1.22
sw by s	1.14	1.19	1.25	1.30	1.36	1.42	1.48	1.54	2.00	2.05	2.09
s w	1.46	1 54	2.02	2.10	2.18	2.26	2.34	2.43	2.50	2.59	3.05
sw by w	2.27	2.38	2.48	2.58	3.09	3.20	3.32	3.44	3.56	4.06	4.14
w s w	3 21	3.30	3.48	4.02	4.16	4.30	4.45	5.01			
w by s	4.33	4.49	5.05	5.22	5.39						
West	6.00										
set	6.00	5.54	5.48	5.42	5 37	5.31	5.24	5.18	5.12	5.06	5.02

A Sun-Dial for the Latitude of 31 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.23	0.22	0.20	0.18	0.17	0.15	0.13	0.11	0.09	0 08	0.07
s s w	0.48	0.45	0.41	0.38	0.34	0.31	0.27	0.23	0.19	0.16	0.13
sw by s	1.16	1.11	1.05	1.00	0.54	0.48	0.43	0.37	0.31	0.25	0.21
s w	1.49	1.41	1.34	1.26	1.18	1.10	1.02	0.53	0.45	0.37	0.32
sw by w	2.30	2.20	2.10	2.00	1.49	1.38	1.27	1.16	1.04	0.54	0.46
w s w	3.25	3 12	2.59	2.40	2 32	2.18	2.03	1.48	1.32	1.18	1.07
w by s	4.36	4.20	4.04	3,48	3.32	3.15	2.57	2.38	2.18	2.00	1.46
West	6.00	5.43	5.26	5.09	4.52	4.33	4,14	3.53	3.31	3.11	2.55
w by n					6.21	6.04	5.46	5.27	5.07	4.49	4.35
w n w									6.43	6.29	6.18
☉ set	6.00	6.06	6.12	6.18	6.24	6.31	6.37	6.44	6 51	6.56	7.01
Sun's Amp.	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
	0.00	2.55	5.50	8.46	11.41	14.37	17.34	20.31	23.31	25.55	27.43

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.23	0.25	0.27	0.28	0.30	0.32	0.34	0.36	0.38	0.39	0.40
s s w	0.48	0.52	0.55	0.59	1.02	1.06	1 10	1.13	1.17	1.20	1.23
sw by s	1.16	1.21	1.27	1.32	1.38	1.44	1.49	1.54	2.01	2.07	2.11
s w	1.49	1.57	2.04	2.12	2.20	2.28	2.36	2 45	2.52	3.01	3.06
sw by w	2.30	2.41	2.51	3.01	3.12	3.23	3.34	3.45	3.57	4 07	4.15
w s w	3.25	3.38	3.51	4.04	4.18	4.32	4.46	5.01			
w by s	4.36	4.50	5.07	5.23							
West	6.00										
☉ set	6.00	5.54	5 48	5.42	5.36	5.29	5.23	5.16	5.09	5 04	4.59

A Sun-Dial for the Latitude of 32 Degrees.

NORTH DECLINATION.

Min. / Deg.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	m	h m	h m	h m	h m	h m	h m	h m	h m	m h	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.24	0.22	0.21	0.19	0.17	0.16	0.14	0.12	0.10	0 09	0.07
s s w	0.50	0.46	0.43	0.39	0.36	0.32	0.29	0.25	0.21	0,18	0 15
sw by s	1.18	1.13	1.07	1.02	0.56	0 51	0.45	0.39	0.33	0.28	0.24
s w	1.52	1.44	1.37	1.29	1.22	1.14	1.05	0.57	0.49	0.41	0.36
sw by w	2.34	2.24	2.14	2.04	1.54	1.43	1.32	1.21	1.09	0.59	0.51
w s w	3.28	3 15	3.03	2.50	2.37	2,23	2.09	1.54	1.39	1.25	1.15
w by s	4 38	4 23	4.08	3.52	3.37	3 .0	3.03	2.45	2.26	2.09	1.55
West	6.00	5.44	5.28	5.11	4.55	4.37	4.19	3.59	3.38	3.19	3.04
w by n					6.21	6.05	5.48	5.30	5.10	4.53	4.39
w n w									6.43	6.30	6,19
☉ set	6.00	6.06	6.13	6.19	6.25	6.32	6,39	6.46	6.53	6.58	7.03
Sun's	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
Ampl.	0.00	2.57	5.54	8.51	11.48	14.47	17.46	20,45	23.47	26.13	28.3

SOUTH DECLINATION

Deg. / Mim.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.24	0.26	0.27	0.29	0.31	0.32	0.34	0.36	0.38	0.40	0.41
s s w	0.50	0.53	0.56	1.00	1.03	1.07	1.11	1.14	1.18	1.21	1.24
sw by s	1.18	1 23	1.29	1.34	1.40	1.45	1.50	1.57	2.03	2.08	2.12
s w	1.52	1.59	2.07	2.14	2.22	2.30	2.38	2.47	2.55	3.02	3.08
sw by w	2.34	2.44	2.54	3.04	3.14	3.25	3.35	3 47	3.59	4.08	4.16
w s w	3.28	3.41	3.53	4 06	4 19	4 33	4.47	5 02			
w by s	4.38	4.53	5.08	5.23							
West	6.00										
☉ set	6.00	5.54	5.47	5.41	5.35	5.28	5.21	5.14	5.07	5.02	4.57

A Sun-Dial for the Latitude of 33 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.25	0.23	0.21	0.20	0.18	0.16	0.15	0.13	0.11	0.09	0.08
s s w	0.51	0.47	0.44	0.41	0.37	0.34	0.30	0.27	0.23	0.19	0.17
sw by s	1.20	1.15	1.09	1.04	0.59	0.53	0.48	0.42	0.36	0.31	0.27
s w	1.54	1.47	1.40	1.32	1.25	1.17	1.09	1.01	0.53	0.46	0.40
sw by w	2.37	2.27	2.17	2.07	1.57	1.47	1.36	1.25	1.14	1.04	0.57
w s w	3.31	3.19	3.06	2.54	2.41	2.28	2.14	2.00	1.45	1.32	1.22
w by s	4.40	4.25	4.11	3,56	3.41	3.25	3.09	2.51	2.33	2.17	2.04
West	6.00	5.45	5.29	5.13	4.57	4.40	4,23	4.04	3.44	3.26	3.12
w by n					6.21	6.05	5.49	5.32	5.13	4.57	4.44
w n w									6.43	6.30	6.20
☉ set	6.00	6.07	6.13	6.20	6.26	6.33	6.40	6.47	6.55	7.01	7.06
Sun's	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
Amp.	0.00	2.59	5.57	8.57	11.55	14.57	17.58	21.0	24.4	26.32	28.23

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.23	0.26	0.28	0.30	0.31	0.33	0.35	0.37	0.39	0.40	0.41
s s w	0.51	0.54	0.58	0.01	1.05	1.08	1.12	1.15	1.19	1.22	1.25
sw by s	1.20	1.25	1.30	1.36	1.41	1.47	1.52	1.58	2.04	2.09	2.13
s w	1.54	2.02	2.09	2.17	2.24	2.32	2.40	2.48	2.56	3.40	3.10
sw by w	2.37	2.46	2.56	3.06	3.16	3.27	3.37	3.48	4.00	4.09	4.17
w s w	3.31	3.43	3.56	4.08	4.21	4.34	4.48	5.02			
w by s	4.40	4.54	5.09	5.24							
West	6.00										
☉ set	6.00	5.53	5.47	5.40	5.34	5.27	5.20	5.13	5.05	4.59	4.54

A Sun-Dial for the Latitude of 34 Degrees.

NORTH DECLINATION.

Min. Deg.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	m	h m	h m	h m	h m	h m	h m	h m	h m	m h	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.25	0.24	0.22	0.20	0.19	0.17	0.15	0.14	0,12	0 10	0.09
s s w	0.52	0.49	0.45	0.42	0.39	0.35	0.32	0.28	0.24	0,21	0 19
sw by s	1.22	1.17	1.12	1.07	1.01	0.56	0.50	0.44	0.38	0.34	0.30
s w	1.57	1.50	1.42	1.35	1.28	1.20	1.12	1.04	0.56	0.49	0.41
sw by w	2.40	2 30	2.21	2.11	2.01	1.51	1.41	1.30	1.19	1.09	1.02
w s w	3.34	3.22	3.10	2.58	2.45	2,33	2.19	2.06	1.51	1.39	1.29
w by s	4 42	4.28	4.14	3.59	3.45	3.30	3.14	2.57	2 40	2.24	2.12
Weſt	6.00	5.45	5.30	5.15	5.00	4.43	4.26	4.09	3.49	2.33	3.19
wby n					6.21	6.06	5.50	5.34	5.16	5.01	4.49
w n w									6.43	6.31	6,21
☉ ſet	6.00	6.07	6.14	6 20	6.27	6.34	6.42	6.49	6.57	7.03	7.08
Sun's	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
Ampl.	0.00	3.01	6.02	9.03	12.5	15.8	18.11	21,16	24.22	26.52	28.45

SOUTH DECLINATION

Deg. Mim.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0,25	0,27	0.29	0.30	0.32	0.34	0.35	0.37	0.39	0.41	0.42
s s w	0.52	0.55	0.59	1.02	1.06	1.09	1,13	1.16	1.20	1.23	1.26
sw by s	1.22	1.27	1.32	1.38	1.43	1.48	1.54	2 00	2.05	2.10	2.14
s w	1.57	2.04	2.11	2.19	2.26	2.34	2.42	2.50	2.57	3.05	3.10
sw by w	2.40	2.49	2.59	3.05	3.18	3.28	3.39	3.50	4.01	4.10	4.18
w s w	3.34	3.46	3.58	4.10	4.22	4 35	4.48	5 02			
w by s	4.42	4.56	5,10	5.24							
Weſt	6.00										
☉ ſet	6.00	5.53	5.46	5.40	5.33	5.26	5.18	5.11	5.03	5.57	4.52

A Sun-Dial for the Latitude of 35 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.26	0 24	0.23	0.21	0 19	0.18	0.16	0.14	0.13	0 11	0.10
s s ws	0.53	0 50	0.47	0 44	0 4[illegible]	0.37	0.33	0.30	0 26	0.23	0 20
sw by s	1.24	1.19	1.14	1.09	1.03	0.58	0.52	0.47	0.41	0.36	0.32
s w	1.59	1.52	1.45	1 38	1.31	1.23	1.15	1.08	0 59	0 53	0.47
sw by w	2.43	2.3[illegible]	2.24	2.14	2.05	1.55	1.4[illegible]	1 34	1.2[illegible]	1.14	1.07
w s w	3.37	3.25	3.13	3.02	2 50	2.37	2.24	2.11	1 5	1.45	1.36
w by s	4.43	4.30	4.16	4.03	3.48	3.34	3.19	3.03	2.46	2.31	2.20
West	6.00	5.46	5.31	5.17	5.02	4.46	4.30	4.13	3.55	3.39	3.26
w by n					6.21	6.07	5.52	5.36	5.19	5.04	4.53
w n w									6.44	6.32	6.22
☉ set	6 00	6.07	6.14	62.1	6.28	6 35	6.43	6.51	6.59	7.06	7.11
Sun's Ampl	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
	0.00	3.03	6.06	9.10	12.12	15.19	18.25	21.31	24.41	27.13	29.5

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.26	0.28	0 29	0.31	0.33	0.34	0.36	0.38	0.40	0.41	0.42
s s w	0.53	0.57	1.00	1.04	1.07	1.10	1.14	1.17	1.21	1.24	1.27
sw by s	1.24	1.29	1.34	1.39	1.45	1.50	1.55	2.01	2.07	2 12	2.15
s w	1.59	2 06	2.14	2.21	2.28	2.36	2.43	2.51	2.59	3.06	3 1[illegible]
sw by w	2.43	2.52	3.01	3.11	3 20	3.3[illegible]	3.4[illegible]	3.5[illegible]	4.02	4 11	4.18
w s w	3.37	3.48	4.00	4.12	4.24	4.3[illegible]	4.49	5.02			
w by s	4.43	4.57	5.11	5.24							
West	6.00										
☉ set	6.00	5.53	5.46	5.39	5.32	5.25	5.17	5 09	5.01	4.54	4.49

A Sun-Dial for the Latitude of 36 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.27	0.25	0 23	0.22	0.20	0.19	0.17	0,15	0.13	0.12	0.11
s s ws	0 55	0.51	0.48	0.45	0.42	0.38	0.35	0.31	0.28	0.24	0.22
sw by s	1.26	1.21	1.16	1.11	1.05	1.00	0.55	0.49	0.44	0.39	0.35
s w	2.02	1.55	1.48	1.41	1.34	1.26	1.19	1.11	1.03	0.56	0.51
swby w	2.45	2.36	2.27	2.18	2.08	1.59	1.49	1.39	1.28	1.19	1.12
w by w	3.39	3.28	3.17	3.05	2 53	2.41	2.29	2.16	2.03	1.51	1.42
w by s	4.45	4.32	4.19	4.06	3.52	3.38	3.23	3.08	2.52	2.38	2.27
Weſt	6.00	5.46	5.32	5.18	5.04	4 49	4.33	4.17	4.00	3.45	3.33
w by n					6.22	6.08	5.53	5.38	5.22	5.08	4.57
w n w									6.44	6.33	6.24
☉ ſet	6.00	6.07	6.15	6.22	6.29	6.37	6.45	6.53	7.01	7.08	7.14
Sun's	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
Ampl.	0.00	3 06	6.11	9.17	12.24	15.31	18.40	21.49	25.0	27.35	29.32

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.27	0.28	0.30	0.31	0.33	0.35	0.36	0.38	0.40	0.41	0.43
s s w	0.55	0.58	1.01	1.05	1.08	1.11	1.15	1.18	1.22	1.25	1.27
sw by s	1.26	1.31	1.36	1.41	1.46	1.51	1.57	2.02	2.08	2.13	2.16
s w	2.02	2 09	2.16	2.23	2.30	2.37	2.45	2.53	3.01	3.07	3.12
sw by w	2.45	2.54	3.04	3.13	3.22	3.32	3.42	3.52	4.03	4.12	4.18
w s w	3 39	3.51	4.02	4.13	4.25	4.37	4.49	5.02			
w by s	4.45	4.58	5.11	5.25							
Weſt	6.00										
☉ ſet	6.00	5.53	5.45	5.38	5 31	5.23	5.15	5.07	4.59	4.52	4.46

A Sun-Dial for the Latitude of 37 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	22	12	12	12	12
s by w	0.27	0.26	0.24	0.23	0.21	0.19	0.18	0.16	0,14	0.13	0.12
s s w	0.56	0,53	0.50	0.46	0.43	0.40	0.36	0.33	0.29	0.26	0.24
sw by s	1.28	1.23	1.18	1.13	1.08	1.02	0.57	0.52	0.47	0 41	0.38
s w	2.04	1.57	1.50	1.43	1.36	1.29	1 22	1.14	1.07	1.00	0 55
sw byw	2.48	2.39	2.30	2.21	2.12	2.03	1 53	1.43	1.33	1.24	1.17
w s w	3.42	3.31	3.20	3.09	2.57	2.43	2.34	2.21	2.08	1.57	1.48
w by s	4.47	4.34	4.21	4.09	3.56	3.42	3.28	3.13	2.58	2.45	2.34
West	6.00	5.47	5.33	5.19	5.06	4.52	4.37	4.21	4.05	3.50	3.39
w by n					6.22	6.08	5.54	5.40	5.24	5.11	5.00
w n w									.44	6.33	6.25
☉ set	6.00	6.08	6.15	6.23	6.31	6.39	6.47	6.55	7.04	7.11	7 17
Sun's Ampl.	d m 0.00	d m 3.08	d m 6.16	d m 9.25	d m 12.32	d m 15.44	d m 18.55	d m 22 8	d m 25.21	d m 27.58	d m 29.58

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.27	0.29	0.31	0.32	0.34	0.35	0.37	0.39	0.41	0.42	0.43
s s w	0.56	0.59	1.02	1.06	1.09	1.12	1,16	1.19	1.23	1.26	1.28
sw by s	1.28	1.33	1.37	1.42	1.47	1.53	1.58	2.04	2.09	2.14	2.17
s w	2.04	2.11	2.18	2.25	2.32	2.39	2.46	2.54	3.02	3.08	3.13
w by w	2.48	2.57	3.06	3.15	3.24	3.33	3.43	3 53	40.3	4.12	4.19
w s w	3.42	3.53	4.04	4.15	4.26	4.38	4.50	5.02			
w by s	4.47	5.00	5.12	5.25							
West	6.00										
☉ set	6,00	5.52	5.45	5.37	5.29	5.21	5,13	5,05	4.56	4.49	4.32

A Sun-Dial for the Latitude of 38 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0 28	0.26	0.25	0.23	0.21	0.20	0.18	0.17	0.15	0 13	0.12
s s w	0.57	0.54	0.51	0.48	0.45	0.41	0.38	0.34	0.31	0.28	0.26
sw by s	1.29	1.24	1.20	1.15	1.10	1.05	1.00	0.54	0.49	0.44	0.41
s w	2.06	2.00	1.53	1.46	1.39	1.32	1.25	1.18	1.10	1.04	1.59
sw by w	2.51	2.42	2.33	2.24	2.15	2.06	1.57	1.47	1.37	1.29	1.22
w s w	3.44	3.34	3.23	3 12	3.01	2.50	2.39	2.26	2.13	2.03	1.54
w by s	4.48	4.36	4.24	4.12	4.00	3.46	3.33	3.18	3.03	2.50	2.40
Weſt	6.0[illegible]	5.47	5.34	5.21	5.08	4 54	4.41	4 25	4.09	3.55	3.45
w by n					6.32	6.09	5.56	5.41	5.26	5.14	5.04
w n w									6.45	6.34	6.26
☉ ſet	6.00	6.08	6.16	6.24	6.32	6.40	6.48	6.57	7.06	7.14	7.19
Sun's Ampl.	d m 0 00	d m 3 10	d m 6.21	d m 9.31	d m 12.43	d m 15.56	d m 19.11	d m 22.26	d m 25.43	d m 28.33	d m 30.24

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.28	0.30	0.31	0.33	0.34	0.36	0.38	0.39	0.41	0.42	0.44
s s w	0 57	1.00	1.04	1.07	1.10	1.13	1.16	1.20	1.24	1.27	1.29
sw by s	1.29	1.34	1.39	1 44	1.49	1 54	1.59	2.05	2.10	2.15	2.18
s w	2.06	2.13	2.20	2.27	2 34	2.41	2.48	2.55	3.03	3.09	3.14
sw by w	2.51	2.59	3.08	3 17	3.26	3.35	3.44	3.54	4.04	4.12	4.19
w s w	3.44	3.55	4.06	4 17	4.28	4 39	4 50	5 02			
w by s	4.48	5.00	5.13	5.25							
Weſt	6.00										
☉ ſet	6.00	5.52	5.44	5.36	5.28	5.20	5.12	5.03	4.54	4.46	4.41

A Sun-Dial for the Latitude of 39 Degrees

NORTH DECLINATION.

Deg. Min.	0 d	2 d	5 d 30m	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.29	0.27	0.25	0.24	0.22	0.21	0.19	0.17	0.16	0.14	0.13
s s w	0.58	0.55	0.52	0.49	0 46	0.43	0.39	0.36	0.32	0.30	0,27
sw by s	1.31	1.26	1.22	1.17	1.12	1.07	1,02	0.57	0.51	0.47	0.43
s w	2.09	2.02	1.55	1 49	1.42	1.35	1.28	1.21	1.13	1.07	1.02
sw by w	2.53	2 45	2.36	2 27	2.19	2.10	2.01	1.51	1.41	1.33	1.27
w s w	3.47	3.36	3.26	3.15	3.05	2.54	2.42	2.31	2.18	2.08	2.00
w by s	4.50	4.38	4.26	4.14	4.02	3.49	3 36	3.23	3.0[illegible]	2.56	2.47
West	6.00	5 48	5.35	5.22	5.10	4.56	4 43	4.28	4.13	4.00	3.50
w by n					6.22	6.10	5.37	5.44	5 29	5.16	5.07
w n w									6.45	6.35	6.27
☉ set	6.00	6.08	6.16	6 24	6.32	6.41	6.50	6.59	7.09	7.16	7.22
Sun's Ampl.	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
	0.00	3.13	6.26	9.40	12.54	16.10	19.28	22.45	26.06	28.4[illegible]	30,52

SOUTH DECLINATION

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
North	12	12	12	12	12	12	12	12	12	12	12
s by w	0.29	0.30	0.32	0.33	0.35	0 36	0.38	0.40	0.41	0.43	0 44
s s w	0.58	1.02	1.05	1.08	1.11	1.14	1.18	1.21	1.25	1.27	1.30
sw by s	1.31	1.36	1.41	1.46	1.51	1.56	2.01	2.06	2.11	2.16	2.19
s w	2.09	2 15	2.22	2.29	2.35	2.42	2,49	2.57	3.04	3.10	3.15
sw by w	2.53	3.02	3.10	3.19	3.27	3.36	3.46	3.55	4.05	4.13	4.20
w s w	3.47	3.57	4.08	4.18	4.29	4 39	4.51	5.03			
w by s	4.50	5.02	5.14	5 26							
West	6.00										
☉ set	6.00	5.52	5.44	5.36	5.28	5 19	5.10	5.01	4 51	4 44	4.38

A Sun-Dial for the Latitude of 40 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0 29	0.28	0.26	0.24	0.23	0.21	0.20	0.18	0.17	0.15	0.14
s s w	1.00	0.57	0.53	0.50	0.47	0.44	0.41	0.37	0.34	0.31	0.29
sw by s	1.33	1.28	1.24	1.19	1.14	1.09	1.04	0.59	0.54	0.49	0.46
s w	2.11	2.04	1.58	1.51	1.45	1.38	1.31	1.24	1.17	1.11	1.06
sw by w	2.56	2.47	2.39	2.30	2.22	2.14	2.04	1.55	1.46	1.38	1.31
w s w	3.49	3.39	3.29	3 18	3.08	2.58	2.46	2.35	2.23	2.13	2.05
w by s	4.51	4.40	4.28	4.17	4.05	3.53	3.40	3.27	3.13	3.02	2.52
West	6.00	5.48	5.36	5.23	5.11	4 59	4.46	4 32	4.17	4.01	3.55
w by n					6.22	6.11	5.58	5.45	5.31	5.19	5.10
w n w								6.58	6.46	6.36	6.28
☉ set	6.00	6.08	6.17	6.25	6.34	6.43	6.52	7.01	7.11	7.19	7.25
Sun's Ampl.	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
	0 00	3.15	6.32	9.48	13.6	16.24	19.45	23.06	26.30	29.16	31.22

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.29	0.31	0.32	0.34	0.35	0.37	0.38	0.40	0.42	0.43	0.44
s s w	1.00	1.03	1.06	1.09	1.12	1.15	1.18	1.22	1.25	1.28	1.30
sw by s	1.33	1.38	1.43	1.47	1.52	1.57	2.02	2.07	2.12	2.17	2.20
s w	2.11	2.17	2.24	2.31	2 37	2.44	2.51	2.58	3.05	3.11	3.16
sw by w	2.56	3.04	3.12	3 21	3.29	3.38	3.47	3.56	4.06	4.14	4.20
w s w	3.49	3.59	4.09	4 19	4.30	4.40	4.51	5.03			
w by s	4.51	5.03	5.14	5.26							
West	6.00										
☉ set	6.00	5.52	5.43	5.35	5.26	5.17	5.08	4.59	5.49	4.41	4.35

A Sun-Dial for the Latitude of 41 Degrees

NORTH DECLINATION.

Deg. Min.	0 d	2 d	5 d 30m	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.30	0.28	0.27	0.25	0.24	0.22	0.21	0.19	0.17	0.16	0.15
s s w	1.01	0.58	0.55	0.52	0 49	0.46	0.42	0.39	0.36	0.33	0,31
sw by s	1.35	1.30	1.25	1.21	1.16	1.11	1,06	1.01	0.56	0.52	0.48
s w	2.13	2.07	2.00	1.54	1.48	1.41	1.34	1.27	1.20	1.14	1.09
sw by w	2.58	2 50	2.42	2.33	2.25	2.17	2.08	1.59	1.50	1.42	1.36
w s w	3.51	3.41	3.31	3.21	3.11	3.01	2.50	2.39	2.28	2.18	2.11
w by s	4.53	4.42	4.30	4.19	4.08	3.57	3.44	3.31	3.18	3.07	2.58
West	6.00	5 48	5.36	5.25	5.13	5.01	4.48	4.35	4.21	4.09	4.00
w by n					6.23	6.12	5.59	5.46	5.33	5.22	5.13
w n w								6.58	6.46	6.37	6.29
⊙ set	6.00	6.09	6.17	6.26	6.35	6.44	6.54	7.04	7 14	7.22	7.29
Sun's Ampl.	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
	0.00	3.18	6.38	9.57	13.18	16.40	20.4	23.29	26.56	29,45	31.54

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
North	12	12	12	12	12	12	12	12	12	12	12
s by w	0.30	0.31	0.33	0.34	0.36	0 37	0.39	0.40	0.42	0.44	0.45
s s w	1.01	1.04	1.07	1.10	1.13	1.16	1.19	1.23	1.26	1.29	1.31
sw by s	1.35	1.39	1.44	1.49	1.5?	1.58	2.03	2.08	2.13	2.18	2.21
s w	2.13	2 19	2.26	2.32	2.3?	2.45	2,52	2.59	3 06	3.12	3.17
sw by w	2.58	3.06	3.14	3.22	3.31	3.39	3.48	3.57	4.06	4.14	4.20
w s w	3.51	4.01	4.11	4.21	4.30	4 4?	4.51	5.03			
w by s	4.53	5.04	5.15	5 26							
West	6.00										
⊙ set	6.00	5.51	5.43	5.34	5.25	5.16	5.06	4.56	4.46	4.38	4.31

A Sun-Dial for the Latitude of 42 Degrees.

NORTH DECLINATION.

Min. Deg.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	m h	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.30	0.29	0.27	0.26	0.24	0.23	0.21	0.20	0.18	0,17	0.16
s s w	1.02	0.59	0.56	0.53	0.50	0 47	0.44	0.41	0.37	0.34	0 32
sw by s	1.36	1.32	1.27	1.23	1.18	1.13	1.05	1.04	0.58	0.54	0 51
s w	2.15	2.09	2.03	1.56	1.50	1.44	1.37	1.30	1.23	1.17	1.13
sw by w	3.00	2.52	2.44	2.36	2.28	2,20	2.12	2.03	1.54	1.46	1.40
w s w	3.53	3.43	3.34	3.24	3.15	3.0[illegible]	2.54	2.44	2 23	2.23	2.16
w by s	4 54	4 43	4.32	4.21	4.10	4.0[illegible]	3.48	3.36	3.23	3.12	3.03
Weſt	6.00	5.49	5.37	5.26	5.15	5.03	4.5[illegible]	4.39	4.24	4.1[illegible]	4.04
w by n					6.23	6.12	6.00	5.48	5.35	5.24	5.16
w n w								6.58	6.47	6.37	6,36
⊙ ſet	6.00	6.09	6.18	6 27	6.3[illegible]	6.46	6.56	7.06	7.17	7.25	7.32
Sun's Ampl.	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
	0.00	3.21	6.44	10.6	13,31	16.56	20.23	23.52	27.24	30.16	32.28

SOUTH DECLINATION

Deg. Mim.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.30	0.32	0.33	0.35	0.36	0.38	0.39	0.41	0.43	0.44	0.45
s s w	1.02	1 05	1.08	1.11	1.14	1.17	1,20	1.23	1.27	1.30	1.32
sw by s	1.36	1.41	1.46	1.50	1.55	1.59	2.04	2.09	2.14	2.19	2.22
s w	2.15	2.21	2,28	2.34	2.40	2.46	2.53	3.00	3.07	3.13	3.17
sw by w	3.00	3.08	3.16	3.24	3.32	3.40	3.49	3.57	4.07	4.14	4.20
w s w	3.53	4.02	4.12	4.22	4.31	4 41	4.52				
w by s	4.54	5.04	5.15	5.26							
Weſt	6.00										
⊙ ſet	6.00	5.51	5.42	5.33	5.23	5.14	5.04	4.54	4.43	4.35	4.28

A Sun-Dial for the Latitude of 43 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	22	12	12	12	12
s by w	0.31	0,29	0.28	0.27	0.25	0.24	0.22	0.21	0.19	0.18	0.17
s s w	1.03	1.00	0.57	0.54	0.51	0.48	0.45	0.42	0.39	0.36	0.34
sw by s	1.38	1.34	1.29	1.25	1.20	1.15	1.11	1.06	1.01	0.57	0.53
s w	2.17	2.11	2.05	1.59	1.53	1.47	1.40	1.33	1.26	1.20	1.16
sw byw	3.02	2.55	2.47	2.39	2.31	2.23	2.15	2.07	1.58	1.50	1.44
w s w	3.55	3.46	3.36	3.27	3.18	3.08	2.58	2.48	2.37	2.28	2.21
w by s	4.55	4.45	4.34	4.23	4.13	4.03	3.52	3.40	3.27	3.17	3.09
West	6.00	5.49	5.38	5.27	5.16	5.05	4.53	4.41	4.27	4.17	4.09
w by n					6.23	6.13	6.01	5.50	5,37	5.27	5.19
w n w								6.58	6.47	6.38	6.31
⊙ set	6.00	6.09	6.19	6.28	6.38	6.48	6.58	7.09	7.19	7.28	7.36
Sun's	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
Ampl.	0.00	3.25	6.51	10.17	13.44	17.13	20.43	24.16	27.53	30.48	33.03

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.31	0.32	0.34	0.35	0.37	0.38	0.40	0.41	0.43	0.44	0.45
s s w	1.03	1.06	1.09	1.12	1.15	1.18	1.21	1.24	1.27	1.30	1.32
sw by s	1.38	1.42	1.47	1.52	1.56	2.01	2.05	2.10	2.15	2.19	2.23
s w	2.17	2.23	2.29	2.36	2.42	2.48	2.54	3.01	3.08	3.14	3.18
w by w	3.02	3.10	3.18	3.26	3.33	3.41	3.51	3.58	4.07	4.14	4.20
w s w	3.55	4.04	4.14	4.23	4.32	4.42	4.52				
w by s	4.55	5.05	5.16	5.26							
West	6.00										
⊙ set	6.00	5.51	5.41	5.32	5.22	5.12	5,02	4,51	4.41	4.32	4.21

A Sun-Dial for the Latitude of 44 Degrees.

NORTH DECLINATION.

Min. Deg.	o d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	m	h m	h m	h m	h m	h m	h m	h m	h m	m h	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.31	0.30	0.29	0.27	0.26	0.24	0.23	0.21	0.20	0,18	0.17
s s w	1.04	1.01	0.58	0.56	0.53	0.50	0.47	0 44	0.40	0.38	0.36
sw by s	1.40	1.35	1.31	1.27	1.22	1.18	1.13	1.08	1.03	0.59	0 56
s w	2.19	2.13	2.07	2.01	1.55	1.49	1.43	1.36	1.29	1.24	1.20
sw by w	3.04	2.57	2.49	2.42	2.34	2,26	2.18	2.10	2.01	1.54	1.49
w s w	3.57	3.48	3.38	3.29	3.21	3.12	3.02	2.52	2.41	2.33	2.26
w by s	4.56	4.46	4.56	4.26	4.16	4.05	3.54	3.43	3.31	3.21	3.13
West	6.00	5.50	5.39	5.28	5.18	5.07	4.56	4.44	4.31	4.21	4.13
w by n					6.23	6.13	6.02	5.51	5.39	5.29	5.21
w n w								6.59	6.48	6.39	6,32
⊙ set	6.00	6.10	6.19	6.29	6.39	6.49	7.00	7.11	7.22	7.31	7.39
Sun's	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
Ampl.	0.00	3.28	6.58	30.27	13,58	17.30	21.5	24.42	28.23	31.22	33.40

SOUTH DECLINATION

Deg. Mim.	o d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.31	0.33	0.34	0.36	0.37	0.39	0.40	0.42	0.43	0.45	0.46
s s w	1.04	1.07	1.10	1.13	1.16	1.19	1,22	1.25	1.28	1.31	1.33
sw by s	1.40	1.44	1.48	1.53	1.57	2.02	2.06	2.11	2.16	2.20	2.23
s w	2.19	2.25	2.31	2.37	2.43	2.49	2.56	3.02	3.05	3.14	3.19
sw by w	3.04	3.12	3.19	3.27	3.35	3.42	3.51	3.59	4.08	4.15	4.20
w s w	3.57	4.06	4.15	4.24	4.33	4 42	4.52				
w by s	4.56	5.06	5.16	5.26							
West	6.00										
⊙ set	6.00	5.50	5.14	5.31	5.21	5.11	5.00	4.49	4.38	4.29	4.21

A Sun-Dial for the Latitude of 45 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	22	12	12	12	12
s by w	0.32	0,31	0.29	0.28	0.26	0.25	0.24	0.22	0.20	0.19	0.18
s s w	1.05	1.03	1.00	0.57	0.54	0.51	0 48	0.45	0.42	0.39	0.37
sw by s	1.41	1.37	1.33	1.28	1.24	1.19	1.15	1.10	1.05	1.01	0.58
s w	2.21	2.15	2.09	2 03	1.58	1.52	1.45	1.39	1.33	1.27	1.23
sw byw	3.06	2.59	2.52	2.45	2.37	2.29	2.22	2.13	2.05	1.58	1 53
w s w	3.59	3.50	3.41	3.32	3.23	3.14	3 05	2.55	2.45	2.37	2.30
w by s	4.57	4.47	4.38	4.28	4.18	4.08	3.57	3.46	3.35	3.26	3.18
West	6.00	5.50	5.40	5.30	5.19	5.09	4.58	4.46	4.35	4.25	4.17
w by n					6.24	6.14	6.03	5.52	5,41	5.31	5.24
w n w								6.59	6.48	6.40	6.33
nwby w											7.40
⊙ set	6.00	6.10	6.20	6.30	6.41	6.51	7.02	7.13	7.25	7.35	7.43
Sun's	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
Ampl.	0.00	3.32	7.05	10.38	14.13	17.49	21.28	25.9	28.56	31.58	34.20

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.32	0.33	0.35	0.36	0.38	0.39	0.41	0.42	0.44	0.45	0.46
s s w	1.05	1.08	1.11	1.14	1.17	1.20	1.23	1.26	1.29	1.31	1.33
sw by s	1.41	1.45	1.50	1.54	1.58	2.03	2.07	2.12	2.17	2.21	2.24
s w	2.21	2.27	2.33	2.39	2.44	2.51	2.57	3.03	3.10	3.15	3.19
w by w	3.06	3.14	3.21	3.28	3.36	3.44	3.51	4.00	4.08	4.15	
w s w	3.59	4.07	4.16	4.25	4.34	4.43	4.52				
w by s	4.57	5.07	5.17	5.26							
West	6.00										
⊙ set	6.00	5.50	5.40	5.30	5.19	5.09	4,58	4,47	4.35	4.25	4.17

A Sun-Dial for the Latitude of 46 Degrees.

NORTH DECLINATION.

Deg. Min	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.33	0.31	0.30	0.29	0.27	0.26	0.24	0.23	0.21	0.20	0.19
s s w	1.06	1.04	1.01	0.58	0.50	0.52	0.49	0.46	0.43	0.41	0.39
swby s	1.43	1.38	1.34	1.30	1.26	1.21	1.17	1.12	1.08	1.04	0.01
s w	2.23	2.17	2.11	2.06	2.00	1.54	1.48	1.42	1.36	1.30	1.26
sw by w	3.08	3.01	2.54	2.47	2.40	2.32	2.25	2.17	2.09	1.02	1.57
w s w	4.00	3.52	3.43	3.35	3.26	3.17	3.08	2.59	2.49	2.41	2.35
w by s	5.58	4.49	4.39	4.30	4.20	4.11	4.00	3.50	3.39	3.30	3.23
West	6.00	5.50	5.40	5.30	5.20	5.11	5.00	4.49	4.38	4.28	4.21
w by n					6.24	6.14	6.04	5.54	5.4	5.33	5.26
w n w								6.59	6.49	6.41	6.34
nwby w											7.40
☉ set	6.00	6 10	6.21	6.31	6 42	6.53	7.04	7.16	7.29	7.39	7.47
Sun's Ampl.	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
	0.00	3.36	7.12	10.50	14.28	18 9	21.52	25.39	29.31	32.37	35.3

SOUTH DECLINATION

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.33	0.34	0.35	0.37	0.38	0.40	0.41	0.42	0 44	0.45	0.46
s s w	1.06	1.09	1.12	1.15	1.18	1.20	1.23	1.26	1.29	1.32	1.34
sw by s	1.43	1.47	1.51	1.5	2.00	2.04	2.08	2.13	2.18	2 22	2.25
s w	2.23	2.29	2.34	2.40	2.46	2.52	2.58	3.04	3.10	3.16	3.20
sw by w	3.08	3.16	2.23	3.30	3.37	3.45	3.52	4.00	4.08	4.15	
w s w	4.00	4.09	4.17	4.26	4.34	4.43					
w by s	4.58	5.08	5.17	5.26							
West	6 00										
☉ set	6 00	5.50	5 39	5.29	5,18	5.07	4.56	4 44	4.31	4.21	4.13

A Sun-Dial for the Latitude of 47 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.33	0.32	0.30	0.29	0.28	0.26	0.25	0.23	0.22	0 21	0.20
s s ws	1.07	1.05	1.02	0.59	0.56	0.54	0.51	0.48	0 45	0.42	0.40
sw by s	1.44	1.40	1.36	1.32	1.28	1.23	1.19	1.15	1.10	1.06	1.03
s w	2.25	2 1[illegible]	2.14	2.08	2.02	1.57	1.51	1.45	1.39	1.33	1.29
sw by w	3.10	3 03	2.56	2.49	2 43	2.35	2.28	2.20	2.13	2.06	2.01
w s w	4.02	3.54	3.4[illegible]	3.37	3.29	3.20	3.12	3.03	2.53	2.45	2.39
w by s	4.59	4.50	4.41	4.32	4.23	4.13	4.03	3.53	3.43	3.34	3.27
Weſt	6.00	5.51	5.41	5.32	5.22	5.12	5.02	4.52	4.41	4.31	4.24
w by n				6 34	6.25	6.15	6.05	5.55	5.44	5.36	5.29
w n w							7.08	6.59	6.49	6.41	6.35
nw by w											7.40
☉ ſet	6.00	6.11	6.22	6.33	6.43	6.55	7.07	7.20	7.32	7.43	7.51
Sun's Ampl	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
	0.00	3.40	7.20	11.2	14.44	18.30	22.18	26.10	30.7	33.18	35.48

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.33	0.34	0 36	0.37	0.38	0.40	0.41	0.43	0.44	0.45	0.46
s s w	1.07	1.10	1.13	1.16	1.18	1.21	1.24	1.27	1.30	1.32	1.34
sw by s	1.44	1 48	1.52	1.57	2.01	2.05	2.09	2.14	2.18	2.22	2.25
s w	2.25	2.30	2.36	2.41	2.47	2.53	2.59	3.05	3.11	3.16	3 20
sw by w	3.10	3.17	3.24	3.31	3.38	3.45	3.53	4.00	4.08	4.15	
w s w	4.02	4.10	4.18	4.26	4.35	4.43					
w by s	5.59	5.08	5.17								
Weſt	6.00										
☉ ſet	6.00	5 49	5.38	5.27	5.17	5.05	4 53	4.40	4.28	4.17	4.09

A Sun-Dial for the Latitude of 48 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0 34	0.32	0.31	0.30	0.28	0.27	0.26	0.24	0.23	0.22	0.21
s s ws	1.08	1.06	1.03	1.00	0.58	0.55	0.52	0.49	0.46	0.44	0.42
sw by s	1.46	1.42	1.38	1.34	1.30	1.25	1.21	1.17	1.12	1.08	1.05
s w	2.27	2.21	2.16	2.10	2.05	1.59	1.53	1.47	1.41	1.36	1.32
swby w	3.12	3.06	2.59	2.52	2.46	2.38	2.31	2.23	2.16	2.09	2.04
w by w	4.03	3.56	3.48	3.40	3.32	3.23	3.15	3.06	2.57	2.49	2.43
w by s	5.00	4.51	4.43	4.34	4.25	4 16	4.06	3,56	3.46	3.38	3.31
Weſt	6.00	5.51	5.42	5.33	5.23	5.14	5.04	4.54	4.43	4.35	4.28
w by n				6.34	6.25	6.16	6.06	5.56	5.46	5.38	5.31
w n w							7.08	6.59	6.50	6.42	6.36
nw byw										7.45	7.40
☉ ſet	6.00	6.11	6.22	6.33	6.45	6.57	7.09	7.22	7.35	7.47	7.56
Sun's	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
Ampl.	0.00	3.44	7.29	11.15	15.2	18.52	22.45	26.43	30.45	3.43	36.35

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.34	0.35	0.36	0.38	0.39	0.40	0.42	0.43	0.45	0.46	0.47
s s w	1.08	1.11	1.14	1.16	1.19	1.22	1.25	1.28	1.31	1.33	1.35
sw by s	1.46	1 50	1.54	1.58	2 02	2.06	2.10	2.15	2.19	2.23	2.26
s w	2 27	2.32	2.37	2.43	2.48	2.54	3.00	3.05	3.12	3.17	3.21
sw by w	3.12	3.19	3 26	3.32	3.39	3.45	3.53	4.01	4 05		
w s w	4.03	4.11	4.19	4.27	4.35	4.44					
w by s	5.00	5.09	5.17	5.26							
Weſt	6.00										
☉ ſet	6.00	5.49	5.38	5 27	5 15	5.03	4.51	4.38	4.25	4.13	4.04

A Sun-Dial for the Latitude of 49 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.34	0.33	0.32	0.30	0 29	0.28	0.26	0.25	0.23	0 22	0.21
s s ws	1.09	1.07	1.04	1.02	1.59	0.56	0.53	0.51	0.48	0.45	0.44
sw by s	1.47	1.43	1.39	1.35	1.31	1.27	1.23	1.19	1.14	1.11	1.08
s w	2.28	2 23	2.18	2.12	2.07	2.01	1.56	1.50	1.44	1.39	1.35
sw by w	3.14	3.07	3 01	2.54	2.48	2.41	2.34	2.27	2.19	2.13	2.08
w s w	4.05	3.57	3.50	3.42	3.34	3.26	3.18	3.09	3.00	2.53	2.47
w by s	5.01	4.53	4.44	4.36	4.27	4.18	4.09	4.00	3.50	3.42	3.35
West	6.00	5.51	5.42	5.34	5.25	5.16	5.06	4.56	4.46	4.38	4.31
w by n				6 34	6.25	6. 16	6.07	5.58	5.48	5.40	5 33
w n w							7.08	7.00	6.51	6.43	6.38
nw by w										7.45	7.40
⊙ set	6.00	6.11	6.23	6.34	6.47	6.59	7.12	7.25	7.39	7.51	8.00
Sun's	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
Ampl	0.00	3.48	7.38	11.28	15.21	19.15	23.14	27.17	31.25	34.48	37.26

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0. 34	0.35	0 37	0.38	0.39	0.41	0.42	0.43	0.45	0.46	0.47
s s w	1.09	1.11	1.15	1.17	1.20	1.23	1.25	1.28	1.31	1.33	1.35
sw by s	1.47	2.51	1.55	2.59	2 03	2.07	2.11	2.15	2.20	2.23	2.26
s w	2.28	2.33	2.39	2.44	2.49	2.55	3.00	3.06	3.12	3.17	3 21
sw by w	3.14	3.20	3.27	3.34	3 40	3.47	3.54	4.01	4.09		
w s w	4.05	4.13	4.20	4.28	4.36	4.44					
w by s	5.01	5.09	5.18								
West	6.00										
⊙ set	6.00	5.49	5.37	5.26	5.13	5.01	4 48	4.35	4.21	4.09	4.00



A Sun-Dial for the Latitude of 50 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.35	0.33	0.32	0.31	0.30	0.28	0.27	0.26	0.24	0.23	0.22
s s w	1.10	1.08	1.05	1.03	1.00	0.58	0.55	0.52	0.49	0.47	0.45
sw by s	1.48	1.45	1.41	1.37	1.33	1.29	1.25	1.21	1.16	1.13	1.10
s w	2.30	2.25	2.20	2.15	2.09	2.04	1.58	1.53	1.47	1.42	1.38
sw by w	3.16	3.09	3.03	2.56	2.50	2.43	2.36	2.30	2.23	2.16	2.12
w s w	4.06	3.59	3.51	3.44	3.36	3.29	3.21	3.13	3.04	2.57	2.51
w by s	5.02	4.54	4.45	4.37	4.29	4.20	4.12	4.03	3.53	3.45	3.39
West	6.00	5.52	5.43	5.34	5.26	5.17	5.08	4.59	4.49	4.41	4.34
w by n				6.34	6.25	6.17	6.08	5.59	5.49	5.42	5.36
w n w							7.08	7.00	6.51	6.44	6.39
nw by w										7.45	7.41
☉ set	6.00	6.12	6.24	6.36	6.49	7.01	7.14	7.28	7.43	7.55	8.05
Sun's Ampl.	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
	0 00	3.53	7.48	11.42	1[illegible].40	19.40	23.45	27.53	32.8	35.37	38.20

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.35	0.36	0.37	0.38	0.40	0.41	0.42	0.44	0.45	0.46	0.47
s s w	1.10	1.13	1.15	1.18	1.21	1.23	1.26	1.29	1.32	1.34	1.36
sw by s	1.48	1.52	1.56	2.00	2.04	2.08	2.12	2.16	2.20	2.24	2.27
s w	2.30	2.35	2.40	2.45	2.50	2.56	3.01	3.07	3.13	3.17	3.21
sw by w	3.16	3.22	3.28	3.35	3.41	3.48	3.55	4.02	4.09		
w s w	4.06	4.14	4.21	4.29	4.36	4.44					
w by s	5.02	5.10	5.18								
West	6.00										
☉ set	6.00	5.48	5.36	5.24	5.11	4.59	4.46	4.32	4.17	4.05	3.55



A Sun-Dial for the Latitude of 51 Degrees

NORTH DECLINATION.

Deg. Min.	0 d	2 d	5 d 30m	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.35	0.34	0.33	0.31	0.30	0.29	0.28	0.26	0.25	0.24	0.23
s s w	1.11	1.09	1.06	1.04	1 01	0.59	0.56	0.53	0.51	0.48	0,47
sw by s	1.50	1.46	1.42	1.39	1.35	1.31	1,27	1.23	1.19	1.15	1.12
s w	2.31	2.26	2.21	2.16	2.11	2.06	2.01	1.55	1.50	1.45	1.41
sw by w	3.17	3 11	3.05	2.59	2.52	2,46	2.39	2.33	2.26	2.20	2.15
w s w	4.08	4.01	3.53	3.46	3.39	3.31	3.24	3.16	3.08	3.01	2.55
w by s	5.03	4.55	4.47	4.39	4.31	4.22	4.14	4.05	3.56	3.49	3.43
West	6.00	5 52	5.44	5.35	5.27	5.18	5 10	5.01	4.52	4.44	4.37
w by n				6.34	6.26	6.17	6.09	6.00	5.51	5.44	5.38
w n w							7.08	7.00	6.52	6.45	6.40
nw byw										7.45	7.41
☉ set	6.00	6.12	6.25	6.38	6.50	7.03	7.17	7.32	7 47	8.00	8.10
Sun's Ampl.	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
	0.00	3.58	7.58	11.57	16.1	20.8	24,18	28.33	32.54	36,30	39.19

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
North	12	12	12	12	12	12	12	12	12	12	12
s by w	0 35	0.36	0.38	0.39	0.40	0 41	0.42	0.44	0.46	0.47	0.48
s s w	1.11	1.14	1.16	1.19	1.21	1.24	1.27	1.29	1.32	1.34	1.36
sw by s	1.50	1.53	1.57	2.01	2.05	2.09	2.13	2.17	2.21	2.24	2.27
s w	2.31	2 36	2.41	2.46	2.52	2.57	3,02	3.07	3.13	3.18	3.21
sw by w	3.17	3.23	3.30	3.36	3.42	3.49	3.55	4.02	4.09		
w s w	4.08	4.15	4.22	4 29	4.37	4 44					
w by s	5.03	5.10	5.18								
West	6.00										
☉ set	6.00	5.48	5.35	5.22	5.10	4.57	4.43	4.28	4.13	4.00	3.50

A Sun-Dial for the Latitude of 52 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.36	0.34	0.33	0.32	0.31	0.30	0.28	0.27	0.26	0.25	0.24
s s w	1.12	1.10	1.08	1.05	1.03	1.00	0.57	0.55	0.52	0.50	0.48
sw by s	1.51	1.47	1.44	1.40	1.36	1.33	1.29	1.25	1.21	1.17	1.15
s w	2.33	2.28	2.23	2.18	2.13	2.08	2.03	1.58	1.52	1.48	1.44
sw by w	3.19	3.13	3.07	3.01	2.55	2.48	2.42	2.36	2.29	2.24	2.19
w s w	4.09	4.02	3.55	3.48	3.41	3.34	3.26	3.19	3.11	3.04	2.59
w by s	5.03	4.56	4.48	4.40	4.33	4.25	4.16	4.08	3.59	3.52	3.46
West	6.00	5.52	5.44	5.36	5.28	5.20	5.12	5.03	4.54	4.46	4.40
w by n				6.34	6.26	6.18	6.10	6.01	5.53	5.45	5.40
w n w							7.08	7.00	6.53	6.46	6.41
nw by w										7.45	7.41
☉ set	6.00	6.13	6.26	6.39	6.52	7.06	7.20	7.35	7.51	8.05	8.16
Sun's Ampl.	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
	0 00	4.03	8.08	12.13	16.23	20.35	24.52	29.14	33.44	37.27	40.23

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.36	0.37	0.38	0.39	0.41	0.42	0.43	0.44	0.46	0.47	0.48
s s w	1.12	1.15	1.17	1.20	1.22	1.25	1.27	1.30	1.33	1.35	1.37
sw by s	1.51	1.55	1.58	2.02	2.06	2.10	2.13	2.17	2.22	2.25	2.28
s w	2.33	2.38	2.43	2.48	2.53	2.58	3.03	3.08	3.13	3.18	3.22
sw by w	3.19	3.25	3.31	3.37	3.43	3.49	3.56	4.02	4.10		
w s w	4.05	4.16	4.23	4.30	4.37	4.44					
w by s	5.03	5.11	5.19								
West	6.00										
☉ set	6.00	5.47	5.34	5.21	5.08	4.54	4.40	4.25	4.09	3.55	3.44

A Sun-Dial for the Latitude of 53 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.36	0.35	0.34	0.33	0.31	0.30	0.29	0.28	0.26	0.25	0.24
s s w	1.13	1.11	1.08	1.06	1.04	1.01	0.59	0.56	0.53	0.51	0.50
sw by s	1.52	1.49	1.45	1.41	1.38	1.34	1.31	1.27	1.23	1.19	1.17
s w	2.34	2.30	2.25	2.20	2.15	2.10	2.05	2.00	1.55	1.51	1.47
sw by w	3.20	3.15	3.09	3.03	2.57	2.51	2.45	3.38	2.32	2.26	2.22
w s w	4.10	4.04	3.57	3.50	3.43	3.36	3.29	3.22	3.14	3.08	3.03
w by s	5.04	4.57	4.49	4.42	4.34	4.27	4.19	4.11	4.02	3.55	3.50
West	6.00	5.52	5.45	5.37	5.29	5.22	5.13	5.05	4.56	4.49	4.43
w by n				6.34	6.26	6.19	6.11	6.03	5.54	5.47	5.42
w n w							7.08	7.01	6.53	6.47	6.42
nw by w									7.51	7.46	7.42
☉ set	6.00	6.14	6.27	6.41	6.54	7.08	7.23	7.39	7.56	8.10	8.21
Sun's	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
Amp.	0.00	4.09	8.19	12.31	16.46	21.5	25.28	29.59	34.36	38.29	41.29

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.36	0.37	0.38	0.40	0.41	0.42	0.43	0.45	0.46	0.47	0.48
s s w	1.13	1.16	1.18	1.20	1.23	1.25	1.28	1.30	1.33	1.35	1.37
sw by s	1.52	1.56	2.00	2.03	2.07	2.10	2.14	2.18	2.22	2.25	2.28
s w	2.34	2.39	2.44	2.49	2.54	2.58	3.03	3.09	3.14	3.18	3.22
sw by w	3.20	3.26	3.32	3.38	3.44	3.50	3.56	4.03			
w s w	4.10	4.17	4.24	4.30	4.37	4.44					
w by s	5.04	5.11	5.19								
West	6.00										
☉ set	6.00	5.46	5.33	5.19	5.06	4.52	4.37	4.21	4.04	3.50	3.39

A Sun-Dial for the Latitude of 54 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0 37	0.35	0.34	0.33	0.32	0.31	0.29	0.28	0.27	0.26	0.25
s s ws	1.14	1.12	1.09	1.07	1.05	1.02	1.00	0.57	0.55	0.53	0.51
sw by s	1.54	1.50	1.47	1.43	1.40	1.36	1.32	1.29	1.25	1.22	1.19
s w	2.36	2.31	2.27	2.22	2.17	2.12	2.08	2.03	1.57	1.53	1.50
swby w	3.22	3.16	3.11	3.05	2.59	2.53	2.47	2.41	2.35	2.29	2.25
w by w	4.12	4.05	3.59	3.52	3.45	3.39	3.32	3.24	3.17	3.11	3.06
w by s	5.05	4 58	4.51	4.43	4.36	4 29	4.21	4.13	4.05	3.58	3.53
West	6.00	5.53	5.45	5.38	5.31	5.23	5.15	5,07	4.59	4.52	4.46
w by n				6.34	6.27	6.19	6.12	6.04	5.56	5.49	5.44
w n w							7.09	7.01	6.54	6.48	6.43
nw byw									7.51	7.46	7.42
⊙ set	6.00	0.15	6.28	6.42	6.56	7.11	7.27	7.43	8.00	8.15	8.27
Sun's	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
Ampl.	0.00	4.14	8.31	12.49	17.11	21.36	26 7	30.46	35.35	39.26	42.46

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.37	0.38	0.39	0.40	0.41	0.42	0.44	0.45	0.46	0.47	0.48
s s w	1.14	1.16	1.19	1.21	1.24	1.26	1.28	1.31	1.33	1.35	1.37
sw by s	1.54	1 57	2.01	2.04	2.08	2.11	2.15	2.19	2.23	2.26	2.28
s w	2 36	2.41	2 45	2.50	2.54	2.59	3.04	3.09	3.15	3.19	3.22
sw by w	3.22	3.27	3.33	3.39	3.41	3.50	3.56	4.03			
w s w	4 12	4.18	4.24	4.31	4.38	4.45					
w by s	5.05	5.12	5.19								
West	6.00										
set	6.00	5.46	5.32	5 18	5.04	4 49	4.3[illegible]	4.17	4.00	3.45	3.33

A Sun-Dial for the Latitude of 55 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.37	0.36	0.35	0.34	0.33	0.31	0.30	0.29	0.28	0.27	0.26
s s w	1.15	1.13	1.10	1.08	1.06	1.03	1.01	0.59	0.56	0.54	0.52
sw by s	1.55	1.51	1.48	1.45	1.41	1.38	1.34	1.30	1.27	1.23	1.21
s w	2.37	2.33	2.28	2.24	2.19	2.14	2.10	2.05	2.00	1.55	1.52
sw by w	3.23	3 18	3.12	3.07	3.01	2.56	2.50	2.44	2.38	2.33	2.29
w s w	4.13	4 06	4.00	3,54	3.47	3.41	3.34	3.27	3.20	3.14	3.10
w by s	5.05	4.59	4.52	4 45	4 38	4.31	4,23	4.16	4.08	4.02	3.56
Weſt	6.00	5.53	5 46	5.39	5.32	5.24	5.17	5.09	5.01	4.54	4.49
w by n				6.34	6.27	6.20	6.13	6.05	5.57	5.51	5.46
w n w							7.09	7.02	6.55	6.49	6.44
nw by w									7.51	7.4[illegible]	7.42
☉ ſet	6.00	6.14	6.29	6 4[illegible]	6.58	7.14	7.30	7.47	8.05	8.21	8.33
Sun's Amp.	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
	0.00	4.21	8.44	13.9	17.37	22.10	26.49	31.37	39.36	40.47	44.00

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.37	0.38	0.39	0.40	0.42	0.43	0.44	0.45	0.46	0.47	0.48
s s w	1.15	1.17	1.20	1.22	1.24	1.26	1 29	1.31	1.34	1.36	1.3[illegible]
sw by s	1.55	1.58	2.01	2.05	2.08	2.12	2.16	2.19	2.23	2.26	2.29
s w	2.37	2.42	2.46	2.51	2 55	2 00	3.05	3.10	3.15	3.19	3.22
sw by w	3.23	3 29	3.34	3 40	3.45	3.51	3.57	4.03			
w s w	4.13	4.19	4.25	4.32	4.38	4.45					
w by s	5.05	5.12	5.19								
Weſt	6.00										
☉ ſet	6.00	5.46	5.31	5.17	5.02	4.46	4.30	4.13	3.55	3 39	3.27

A Sun-Dial for the Latitude of 56 Degrees.

NORTH DECLINATION.

Deg. Min	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0 37	0.36	0.35	0.34	0.33	0.32	0.31	0.30	0.28	0.27	0.26
s s w	1.16	1.14	1.11	1.09	1.07	1.05	1.02	1.00	0.57	0.55	0.53
swby s	1.56	1.53	1.49	1.46	1.43	1.39	1.36	1.32	1.28	1.26	1.23
s w	2.39	2.34	2.30	2.26	2.21	2.16	2.12	2 07	2.02	1.59	1.55
sw by w	3.25	3.19	3.14	3.09	3.03	2.58	2.52	2.46	2.40	2.36	2.32
w s w	4.14	4.08	4.02	3.56	3.50	3.43	3.37	3.30	3.23	3.17	3.13
w by s	5.06	5.00	4.53	4.46	4.40	4.33	4.26	4.18	4.11	4.05	4.00
West	6.00	5.53	5.46	5.39	5.32	5.26	5.18	5.11	5.03	4.57	4.52
w by n				6.34	6.28	6.21	6.14	6.06	5.59	5.53	5.48
w n w						7.15	7.09	7.02	6.55	6.50	6.45
									7.51	7.46	7 43
☉ set	6.00	6 15	6.30	6.45	7 00	7.16	7.34	7.52	8.11	8.27	8.41
Sun's Ampl.	d m 0.00	d m 4.28	d m 8.57	d m 13.29	d m 18.5	d m 22.46	d m 27.34	d m 32.32	d m 37.42	d m 42.4	d m 45.27

SOUTH DECLINATION

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.37	0.39	0.40	0.41	0.42	0.43	0.44	0.45	0.47	0.48	0.48
s s w	1.16	1.18	1.20	1.22	1.25	1.27	1.29	1.32	1.34	1.36	1.38
sw by s	1 56	1.59	2.02	2.06	2.09	2.13	2.16	2.20	2.24	2 26	2.29
s w	2.39	2.43	2.47	2.52	2.56	3.01	3.06	3.10	3.15	3.19	
sw by w	3.25	3.30	3.35	3.40	3.46	3.51	3.57	4.03			
w s w	4.14	4.20	4.26	4.32	4.38						
w by s	5 06	5.13	5.19								
West	6 0.										
☉ set	6 00	5.45	5 30	5.30	5,15	4 44	4.26	4.08	3.49	3 33	3.19

A Sun-Dial for the Latitude of 57 Degrees

NORTH DECLINATION.

Deg. Min.	0 d	2 d	5 d 30m	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.38	0.37	0.36	0.35	0.34	0.32	0.31	0.30	0.29	0.28	0.27
s s w	1.17	1.14	1.12	1.10	1 08	0.06	1.04	1.01	0.59	0.57	0,55
sw by s	1.57	1.53	1.51	1 47	1.44	1.41	1,37	1.34	1.50	1.27	1.25
s w	2.40	2.36	2.31	2.27	2.23	2.18	2.14	2.10	2.05	2.01	2.58
sw by w	3.26	3 21	3.16	3 11	3.05	3.00	2.55	2.49	2.43	2.28	2.34
w s w	4 15	4.09	4.03	3.57	3.51	3 45	3.39	3.33	3.26	3.20	3.16
w by s	5.07	5 01	4.54	4 47	4.41	4.34	4 28	4.21	4.13	4.07	4 03
West	6.00	5.53	5.47	5.40	5 33	5.27	5 20	5.12	5.05	4.59	4.54
w by n				6.34	6.28	6.21	6.14	6.07	6.00	5.54	5.50
w n w						7.15	7.09	7.03	6.56	6.51	6.46
nw by w									7.51	7.47	7.43
n w											8.38
⊙ ſet	6.00	6.16	6.31	6.47	7.03	7.27	7.38	7.56	8 16	8.34	8.48
Sun's Ampl.	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
	6.00	4.35	9.11	13.52	18.33	23.24	28.23	33.31	38,53	43.27	47.2

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
North	12	12	12	12	12	12	12	12	12	12	12
s by w	0 38	0.39	0.40	0.41	0.42	0.43	0.44	0.46	0.47	0.48	0.49
s s w	1.17	1.19	1,21	1.23	1.25	1.27	1.30	1.32	1.34	1.36	1.38
sw by s	1 57	2 00	2 03	2.07	2.10	2.13	2.17	2.20	2.24	2.27	2.29
s w	2.40	2.44	2 48	2.53	2.57	3 02	3,06	3.10	3.15	3.19	
sw by w	3.26	3.31	3.36	3.41	3.46	3 51	3.57	4.03			
w s w	4.15	4.21	4.26	4.32	4.38						
w by s	5.07	5.13	5.19								
West	6.00										
⊙ ſet	6.00	5.44	5.29	5.13	4.57	4.40	4.22	4.04	3.44	3.26	3.12

A Sun-Dial for the Latitude of 58 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0 38	0.37	0.36	0.35	0.34	0.33	0.32	0.31	0.30	0.29	0.28
s s ws	1.17	1.15	1.13	1.11	1.09	1.17	1.05	1.02	1.00	0.58	0.57
sw by s	1.58	1.55	1.52	1.49	1.46	1.42	1.39	1.36	1.32	1.29	1.27
s w	2.41	2.37	2.33	2.29	2.25	2.20	2.16	2.12	2.07	2.04	2.01
swby w	3.27	3.22	3 17	3.12	3.07	3.02	2.57	2.51	2.46	2.41	2.38
w by w	4.16	4.10	4 05	3.59	3 53	3.47	3.41	3 35	3.29	3.23	3.19
w by s	5.07	5 01	4.55	4.49	4.43	4 36	4.30	4.23	4.16	4.10	4.06
West	6.00	5.54	5.47	5.41	5.34	5.28	5.21	5,14	5.08	5.02	4.57
w by n				6.34	6.28	6.22	6.15	6.08	6.02	5.56	5.51
w n w						7.16	7.10	7.03	6.57	6.52	6.48
nw byw								7.57	7.52	7.47	7.44
n w											8.38
⊙ set	6.00	6.16	6.32	6.49	7.06	7.24	7.42	8.01	8.22	8.41	8.56
Sun's	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
Ampl.	0.00	4.43	9.26	4.16	19 7	24.6	29.14	44.34	40.12	14.59	48.49

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 0m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0 38	0.39	0.40	0.41	0.43	0.44	0.45	0.46	0.47	0.48	0.49
s s w	1 17	1.19	1.22	1.24	1.26	1.28	1.30	1.32	1.35	1.37	1.38
sw by s	1.58	2 01	2.04	2 07	2 10	2.14	2 17	2.21	2.24	2.27	2.29
s w	2 41	2.45	2.49	2.53	2.57	3.02	3.06	3.10	3.15	3.19	
sw by w	3.27	3.32	3 37	3.42	3.47	3.52	3.57				
w s w	4 16	4.21	4.27	4 33	4.38						
w by s	5.07	5.13	5.19								
West	6 00										
⊙ set	6.00	5.44	5.28	5.11	4 54	4 36	4.18	3.59	3.38	3.19	3.04

A Sun-Dial for the Latitude of 59 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.39	0.38	0.37	0.36	0.35	0.34	0.32	0.31	0.30	0.29	0.29
s s w	1.18	1.16	1.14	1.12	1.10	1.08	1.06	1.04	1.01	1.00	0.58
sw by s	1.59	1.56	1.53	1.50	1.47	1.44	1.41	1.38	1.34	1.31	1.29
s w	2.42	2.38	2.35	2.31	2.27	2.23	2.19	2.14	2.10	2.06	2.03
sw by w	3.28	3.24	3.19	3.14	3.09	3.04	2.59	2.54	2.49	2 44	2.41
w s w	4.17	4.12	4.06	4,01	3.55	3.49	3.43	3.38	3.32	3.26	3.22
w by s	5.08	5.02	4.56	4.50	4.44	4.38	4,32	4.25	4.19	4.13	4.09
West	6.00	5.54	5 48	5.42	5.35	5.29	5.23	5.16	5.09	5.04	4.59
w by n				6.35	6.29	6.22	6.16	6.10	6.03	5.58	5.53
w n w						7.16	7.10	7.04	6.58	6.53	6.49
nw by w								7.57	7.52	7.48	7.44
n w										8.42	8.38
☉ set	6.00	6.16	6.33	6.50	7.08	7.27	7.46	8.07	8.29	8.49	9.05
Sun's Amp.	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
	0.00	4.51	9.43	14.41	19.41	24.51	30.12	35.43	41.37	46.40	50.42

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.39	0.40	0.41	0.42	0.43	0.44	0.45	0.46	0.47	0.48	0.49
s s w	1.18	1.20	1.22	1.24	1.26	1.28	1 31	1.33	1.35	1.37	1.38
sw by s	1.59	2.02	2.05	2.08	2.11	2.14	2.18	2.21	2 24	2.27	2.29
s w	2.42	2.46	2.50	2.54	2.58	3 02	3.06	3.11	3.15		
sw by w	3.28	3.33	3.38	3.43	3.47	3.52	3.57				
w s w	4.17	4.22	4.28	4.33	4.39						
w by s	5.08	5.14	5.19								
West	6.00										
☉ set	6.00	5.44	5.27	5.10	4.52	4.33	4.14	3.53	3.31	3 11	2.55

A Sun-Dial for the Latitude of 60 Degrees.

NORTH DECLINATION.

Min. Deg.	0 d	2 d	5 d 30m	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	m h	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.39	0.38	0.37	0.36	0.35	0.34	0.33	0.32	0.31	0.30	0 29
s s w	1.19	1.17	1.15	1 13	1.11	1.09	1.07	1.05	1.03	1.01	1 00
sw by s	2.00	1.57	1.54	1.51	1.48	1.45	1.42	1.39	1.36	1.33	1.31
s w	2.44	2.40	2.36	2.32	2.28	2.24	2.20	2.16	2 12	2.08	2.06
sw by w	3.29	3.25	3.20	3.16	3.11	3.05	3.01	2.56	2.51	2,47	2.44
w s w	4.18	4.13	4.07	4.02	3.57	3.51	3.46	3 40	3.34	3.29	3.25
w by s	5.08	5.03	4 57	4.51	4.45	4.40	4.34	4.27	4.21	4.16	4.12
West	6.00	5 54	5.48	5.42	5.36	5.31	5.24	5.18	5.11	5 06	5.02
w by n				6.35	6.29	6 23	6.17	6.11	6.04	5.59	5.55
w n w						7.16	7.10	7.04	6 59	6.54	6.50
nw by w								7.57	7.52	7.48	7 45
n w										8.41	8.39
☉ set	6 00	6.17	6.35	6 50	7.11	7.30	7.51	8.13	8.36	8.58	9.16
Sun's Ampl.	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
	0 0	5.00	10.2	15.8	20.18	2[illegible].39	31.09	36,58	43.10	48.32	52.5

SOUTH DECLINATION

Deg. Mim.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.39	0.40	0.41	0.42	0.43	0.44	0.45	0.46	0.47	0 48	0.49
s s w	1.19	1.21	1.23	1.25	1.27	1 29	1,31	1.33	1.35	1.37	1.38
sw by s	2,00	2.03	2.06	2,09	2.12	2.15	2.18	2.21	2.24	2.27	2.29
s w	2.44	2 47	2.51	2.55	2 59	3.03	3.0[illegible]	3.11	3.15		
sw by w	3 29	3.34	3.39	3.43	3 48	3.53	3.58				
w s w	4.18	4.23	4.28	4.33	4 39						
w by s	5.08	5.14	5.20								
West	6.00										
☉ set	6.00	5 43	5.25	5.08	4.49	4.30	4.09	3.47	3 24	3.07	2.44

The Deſcription and Uſe of the foregoing Sun-Dial TABLES.

THESE Tables are intitled at the Head of each Page thus: *A Sun-Dial for the Latitude of* 0 *Degree*; the next is, *A Sun-Dial for the Latitude of* 1 *Degree*, and ſo on orderly unto 60 Degrees, making in all 61 Dials; from Page 24 to Page 84.

Each Dial hath two Tables, the uppermoſt for North Declination, the lowermoſt for South Declination, and 12 Columns in each Table: At the Head of each Column, and right againſt Deg. Min. are the Degrees of Declination thus; | 0d. | 2d. 30m. | 5d. | 7d. 30m. | 10d. 12d. 30m. | 15d. | 17d. 30m. | 20d. | 22d. 23d. 29m. d. ſtanding for Degrees, and m. for Minutes.

Under thoſe Degrees and Minutes of Declination in each Column is ſet h. m. h. ſtands for Hours, and m. for Minutes of an Hour.

In the Left-hand Column of each Table under Points, at the Head, are the Points of the Compaſs, thus, South, S. by W. SSW. SW. by S. SW. *&c.* S. by W. ſtanding for South and by Weſt; SSW. for South South Weſt; SW. by S. for South Weſt by South, and ſo for the reſt.

At the Foot of each Table, is the Sun's Setting and Sun's Amplitude, agreeable to thoſe ſeveral Declinations at the Head of each Column; and are diſtinguiſhed from the reſt by the Words in the Left-hand Column, thus, ☉ ſet, Sun's Amplitude, or ſo much of them as the Column can contain. *Note*, the Sun's ſetting is annexed to each Table, but the Sun's Amplitude only to that for North Declination, becauſe it's the ſame (as to Quantity) for South Declination.

The Sun's ſetting is Hours and Minutes, but the Amplitude is Degrees and Minutes, having (d) over the Degrees, and m over the Minutes.

By theſe Tables (being Sun Dials for all Latitudes) may be known the Time f the Day, the Sun being viſible in any Part of the Hemiſphere as true and exact as though he was upon the Meridian; Alſo his Riſing, Setting, and Amplitude. The like may be known by any Star, whoſe Declination doth not exceed 23d. 29m. as will be evident by the following Propoſitions.

Propoſition 1. THE Latitude of a Place, the Sun's Declination, and his Bearing being given; to find the Hour of the Day.

Note, By Bearing is meant the Azimuth or Point of the Compaſs he is upon; and that is found by ſetting the Sun with an Azimuth Compaſs, which is the trueſt Way, proper Allowance being made for the Variatiou, and is to be preferred before ſetting the Sun with a common Compaſs.

The Reſolution of this Propoſition is thus;

1. Seek in the *Sun Dial Tables* for the given Latitude.

2. At the Head of the Table ſeek the given Declination, or the neareſt to it.

3. Find the given Bearing among the Points of the Compaſs in the Left-hand Column.

4. Then look ſtraight to the Right-hand of the Bearing, till you come right under the Declination (before found) in the Head of the Table, and what Number you find there is the Hour required.

Example 1. In the Latitude of 30 Degrees, the Sun having 15 Degrees North Declination, I deſire to know at what o'clock the Sun cometh upon the SW. Point of the Compaſs?

Look for the Table belonging to the Latitude of 30 Degrees, which is in Page 54, and in the Head thereof, ſeek for 15 Degrees in the Column under North Declination, and on its Left-hand Side for SW. and then in the common Angle of Meeting you will find the Hour of the Day to be 0h. 58m. that is 58 Min. paſt 12 o'Clock, the Time required.

Example

Example 2. I deſire to know at what o'Clock the Sun cometh to the SW. in the Latitude of 30 Degrees, his Declination being 15 Degrees South? *Anſwer*, 34 Minutes paſt 2 o'Clock.

For if you turn to the Dial for Latitude 30 Degrees, in Page 54, and in the Table for South Declination ſeek 15d. at the Head of it, under which, and right againſt SW. (on the Left-hand) you will find 2h. 34m. the Time of the Day required.

If the Declination be not the ſame with the Declination in the Head of the Table; then look under that Declination which is neareſt to the Declination propoſed.

But more exactly thus, *Find the Hour for the next Declination both leſs and greater than the Declination propoſed*, and take the Difference of thoſe Hours, as alſo of the Declination belonging to them: Then ſay,

As the laſt Difference is to the firſt Difference; ſo is the Difference between the Declination propoſed and the next leſs in the Table, to a fourth proportional, which add to *(when the Hour in the Table increaſeth)* or *(when it decreaſeth)* ſubſtract from the Hour belonging to the leſs Declination aforeſaid, and you will have the Hour required exact to the Declination propoſed.

Example 3. Admit the Declination to be 18 Deg. 20 min. North, I deſire to know at what o'Clock the Sun cometh upon the WSW. Point of the Compaſs, in the Latitude of 30 Degrees?

In the Table, the neareſt Number to 18 Deg. 20 Min. is 17d. 30m. Then under 17d. 30m. and againſt WSW. is 1h. 42m. which ſheweth that the Sun cometh upon the WSW. Point of the Compaſs, at 42 Min. paſt one o'Clock.

Now becauſe the Declinatiou propoſed, and the Declination in the Head of the Table are ſomewhat different; therefore you may make a Proportion very eaſily thus, under 17d. 30m. and againſt WSW. you will find

 1h.

1h. 42m. and under 20d. 00m. you'll find 1h. 25m. the difference between theſe two Numbers is 17m. And the difference between the Declination 17d. 30m. and 20d. is 2d. 30m. or 150m. Alſo the difference between the Declination 18d. 20m. and 17d. 30m. is 50m. Then ſay, As 150m. is to 17m. ſo is 50m. to 6m. almoſt: But becauſe 50 is $\frac{1}{3}$ of 150, therefore the Third Part of 17m. is near 6m. which ſubtracted from 1h. 42m. (becauſe the Hour decreaſeth) and the Remainder 1h. 36m. is the true Hour of the Day, the Sun being upon the W. S W. Point of the Compaſs, having 18d. 20m. North Declination.

Do the like with any other Degrees and Minutes of Declination: But if the Declination be not very different from that in the Head of the Table, you need not make any Proportion: Likewiſe when the Sun is near the Meridian, you need not make any Proportion, becauſe there the difference is but ſmall.

Note, There are none but the *Afternoon Points* in the Tables of theſe *Dials*, yet you may eaſily find the Time of the Day for the *Forenoon Points* by what follows.

For Points equally diſtant from the Meridian, are equal Time from Noon, ſo that at what ſpace of Time from Noon the Sun is S.E. in the Forenoon, the like ſpace of Time from Noon he is S.W. Afternoon.

As in the Table following, the Points that ſtand right againſt one another, are equally diſtant from the Meridian; therefore to find the Hour of the Day, the Sun being upon any of the Forenoon Points; ſee what Time of the Day it is when the Sun is upon the Afternoon Points that ſtand right againſt the Forenoon Points deſired, and ſubtract thoſe Hours and Minutes from 12 Hours, the Remainder is the Hour and Minute of the Day required.

A TABLE

A TABLE *of the Points of the Compass, equally distant from the Meridian.*	
Forenoon Points.	Afternoon Points.
South	South
South by East	South by West
South South East	South South West
South East by South	South West by South
South East	South West
South East by East	South West by West
East South East	West South West
East by South	West by South
East	West
East by North	West by North
East North East	West North West
North East by East	North West by West
North East	North West
North East by North	North West by North
North North East	North North West
North by East	North by West
North	North
Forenoon Points.	Afternoon Points.

Example 4. In the Latitude of 60 Degrees, the Sun being North East; I demand the Hour of the Day, the Sun having 22 Degrees North Declination.

In the *Sun-Dial* for Latitude 60 Degrees, (in Page 84) look against NW. which is the *Afternoon Point*, correspond-ing to N.E. the *Forenoon Point)* and finding the Declination 22 Degrees in the Head of the Table, in the common Angle of Meeting is 8 Hours 41 Minutes, which subtract from 12 Hours, the Remainder 3 Hours 19 Minutes, is the Hour of the Day required in the Morning.

Example

Example 5. The Sun being ENE. in the ſame Latitude with the ſame Declination ; I demand the Hour of the Day ?

In Latitude 60 Degrees, and North Declination 22 Degrees, the Sun being WNW. it is 54 Minutes paſt ſix o'Clock in the Afternoon ; which ſubtract from 12 Hours, the Remainder is 6 Minutes paſt 5 in the Morning ; the Time deſired.

Example. In the Latitude 35 Degrees North, the Sun having 15 Degrees North Declination ; and being South Eaſt by Eaſt ; I demand the Hour and Minute of the Day ?

In the Table for Latitude 35 Degrees (in Page 59) look againſt SW. by W. (the Afternoon Point) correſpondent to SE. by E. (the Forenoon Point.) And the Declination 15d. at the Head of the Table, and in the common Angle of Meeting is 1h. 45m. which deducted from 12 Hours, the Remainder is 15 Min. paſt 10 o'Clock, the true Time of the Day deſired.

Example 7. In the Latitude 35 Degrees North, the Sun having 15 Degrees South Declination, and being SE. by E. I demand the Hour of the Day.

Anſwer, 20 Minutes paſt 8 o'clock ; for the Hour in the Table is 3 Hours 40 Minutes, which ſubſtracted from 12 Hours, leaveth 8 Hours 20 Minutes the Hour required.

The like is to be underſtood of any other Latitude, with any other Declination, and with any other Point of the Compaſs.

Note, Theſe Tables ſerve as well in *South Latitude*, as in *North Latitude*, the only Difference will be this:

If the Latitude be contrary, then the Declination muſt be contrary, and the Points of the Compaſs contrary ; that is to ſay, North Declination muſt be counted South ; and South Declination muſt be counted North ; and the South Point

Point muſt be North ; and S. by W. muſt be N.byW. and S.S.W. muſt be N.N.W. and S.W.by S. muſt be NW.by N. and ſo for any other Point, as in the following Table.

A TABLE of Points equally diſtant from Noon, both in North Latitude and in South Latitude, either before Noon or after Noon.

North Latitude.		South Latitude.	
Forenoon.	Afternoon.	Forenoon.	Afternoon.
S. by E. S. S. E. S. E. by S. South Eaſt	S. by W. S. S. W. S. W. by S. South Weſt	N. by E. N. N. E. N. E. by N. North Eaſt	N. by W. N. N. W. N. W. by N. North Weſt.
S. E. by E. E. S. E. E. by S. Eaſt.	S. W. by W. W. S. W. W. by S. Weſt	N. E. by E. E. N. E. E. by N. Eaſt	N. W. by W. W. N. W. W. by N. Weſt
E. by N. E. N. E. N. E. by E. North Eaſt	W. by N. W. N. W. N. W. by W. North Weſt	E. by S. E. S. E. S. E. by E. South Eaſt	W. by S. W. S. W. S. W. by W. South Weſt.
N. E. by N. N. N. E. N. by E. North	N. W. by N. N. N. W. N by W. North	S. E. by E. S. S. E. S. by E. South	S. W. by S. S. S. W. S. by W. South

Propoſition 2 *To find the Hour of the Night by the Stars, and the Tables of Sun-Dials.*

YOU may find the Hour of the Night by the Bearing of any known Star, whoſe Declination doth not exceed the Sun's greateſt Declination, after this Manner.

Find

Find the Time of the Star's coming to the Meridian on the Day propoſed ; then if the Star be on the Eaſt Side of the Meridian, ſubſtract the Hours and Minutes which theſe Tables ſhews, from the Time of the Star's coming to the Meridian, the Remainder is the Hour of the Night: But if the Star be on the Weſt Side of the Meridian, then add thoſe Hours and Minutes aboveſaid, to the Time of the Star's coming to the Meridian, the Sum is the Hour of the Night.

To find what Time the Stars come upon or to the Meridian, ſee the *Mariner's Calendar*, in the Uſes of the Tables of the Sun's and Stars Right Aſcenſion, Pages 57, 58, 59, 60, and 61.

Example 8. Admit the 26th of *October* 1779, in the Latitude 40 Degrees North, I obſerve the *Bull's-Eye* to be S.E. I demand the Hour of the Night?

The 26th of *October*, 1779, the *Bull's Eye* cometh on the Meridian at 19 Minutes paſt 2 o'Clock in the Morning; this Star's Declination is 16 Deg. North, therefore in the Table that belongs to 40 Degrees in Page 64, ſeek in the Head of the Table the Declination of the Star, or neareſt thereto, and by the Side, the Point of the Compaſs, and in the common Angle of Meeting, is 1h. 31m. which ſubtract from 2h. 19m. the Star's Southing, the Remainder 0 hours 48 min. is the Hour of the Night deſired. But if this Star had born S.W. you muſt have added, and then the Hour would have been 50 min. paſt 3 o'Clock in the Morning.

The Operation.

	h.	m.
The Time of the Stars being on the Meridian———	2 :	19
His Diſtance from the Meridian either at SE. or SW.	1 :	31
The Time of the Night, the Star being SE.———	0 :	48
The Time of the Night, the Star being SW.———	3 :	50

Example

Example 9. Admit the 16th Day of *November*, in Latitude 45 Degrees North; I ſee the *Lyon's Tail* upon the ESE. Point of the Compaſs, having Declination 15d. 57m. North, I demand the Hour of the Night.

The Operation.

	h. m.
Time of the Star's being on the Meridian	08 : 10 Morn.
His Diſtance from the Meridian being —	03 : 02
Time of the Night, the Star is E. S. E.	05 : 08 Morn.
Time when this Star is W.S.W.	11 : 12 Morn.

Note, If the Compaſs hath Variation, you muſt allow for the Variation; but if you will uſe this following Inſtrument, which I call the Rectifier, you need not reckon which Way the Variation is, either Eaſtward or Weſtward; for this Inſtrument will do it ſo plain, that you cannot be miſtaken, as is ſhewn in the following Part of this Book: But for the preſent I will only give you one Propoſition, and apply it upon the Rectifier, which is as followeth:

Propoſition. Admit in Lat. 47 Deg. North, the Sun being in one of the Equinoctial Points, at which Time he hath no Declination, I obſerve the Sun to riſe upon the E.S.E. Point of the Compaſs, I demand the Variation?

The Sun having no Declination, in any Latitude, (if there be no Variation) the Sun will riſe at Eaſt, and ſet at Weſt; but according to the foregoing Propoſition, the Sun did riſe E.S.E. therefore there are two Poins Variation, as will appear by the following Rectifier.

The Deſcription of the RECTIFIER.

THIS Inſtrument containeth two Circles or Compaſſes one within the other; but as it is made of Wood, the one moveth upon the other; ſo that the inward, or upper

upper Circle repreſenteth the Compaſs that you ſteer by, which is ſubject to Variation : But the outward or under Circle repreſenteth a true Compaſs that never varieth. And by it you may readily rectify your Compaſs when it doth vary ; thus.

Always bring the true Point of Riſing or Setting on the outward or under Compaſs to touch the falſe Point of Riſing or Setting on the inward or upper Compaſs, there let the Inſtrument ſtand.

As in the foregoing *Propoſition* ; The Eaſt Point is the true Point of Riſing, and ESE. Point is the falſe Point of Riſing ; therefore bring the Eaſt Point on the outward or under Compaſs, to touch the ESE Point on the inward or upper Compaſs.

Then the Points that are on the outward or true Compaſs do explain the Points that are upon the inward or ſteering Compaſs ; ſo that according to this Obſervation the NNE. Point on your Compaſs, is the true North Point ; and the North is the true NNW. and the NW. is the true WNW. and the Weſt the true WSW. Point ; as plainly appears by the Rectifier.

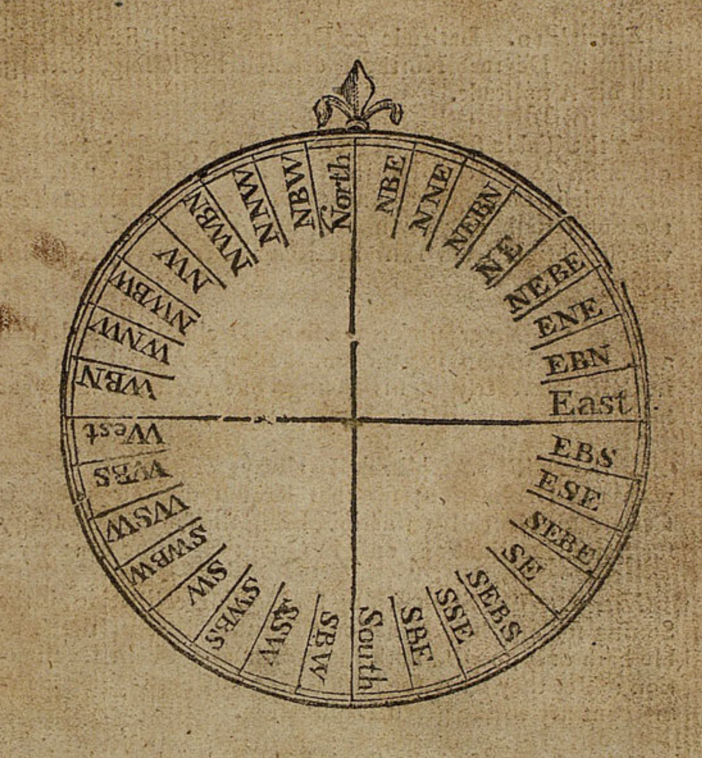
Note, The true Points are always counted on the outward Circle or Compaſs.

This Inſtrument in Wood, is larger than this Figure, and there the Points are divided into Halves and Quarters ; as alſo each Compaſs (in ſome) is divided into 360 Degrees numbered from the North and South, (both ways) towards the Eaſt and Weſt, ending there in 90 Degrees.

A right Knowledge of the Quantity and Quality of the *Variation* of the Compaſs in different Latitudes and Longitudes, is of the utmoſt Importance, not only in the preceding Propoſition, but in all others where *Bearings* are required, and eſpecially in correcting the Courſes ſteered by a Ship at Sea ; for which Purpoſe an accurate Variation Chart conſtructed from more than Fifty Thouſand actual Obſervations, by *William Mountaine*, F. R. S. is ſold by Meſſ. *Mount and Page*, on *Tower Hill.*

The

The RECTIFIER.



Propoſition 3. *To find the Sun's Riſing, Setting, or Amplitude by the Tables of the Sun's Dials.*

IN the Table for the Latitude of the Place, ſeek the Declination, under which, and againſt ☉ *ſet*, is the Sun's Setting; and againſt *Sun's Ampl.* is the Amplitude.

And

And if you ſubſtract the Sun's Setting from 12 Hours, it gives its Riſing.

Example 10. Latitude 50 Degrees North, Sun's Declination 20 Degrees North, I demand his Riſing, Setting, and his Amplitude.

In the Table for 50 Degrees (in Page 74) ſeek the Declination 20 Degrees North at the Head of the Table, under which, and right againſt ☉ *ſet* is 7.43, which ſheweth the Sun ſetteth at 43 Minutes after 7 in the Afternoon; which ſubtract from 12h. the Remainder 4h. 17m. is his Riſing.

In like Manner under the Sun's Declination 20d. and againſt Sun's Amp. is 32d. 8m. the Sun's Amplitude; that is, Eaſt Northerly at his Riſing, but Weſt Northerly at his Setting.

Note 1. The Amplitude is always of the ſame Name with the Declination, for that Reaſon the Amplitude is ſet only for North Declination, being the ſame in Quantity for South Declination, only in Quality it is the contrary.

Note 2. The Sun's Riſing for North Declination, is the Setting for South Declination: For that Reaſon, the Table hath only ☉ *ſet*, both for North and South Declination: Yet they ſerve for both Riſing and Setting, by looking contrary to the given Declination.

Wherefore to find the Sun's Riſing when he hath North Declination, look under South Declination; and when he hath South Declination (to find his Riſing) look under North Declination.

Note 3. In South Latitude with South Declination, alſo in South Latitude with North Declination, the Sun's Riſing and Setting is the ſame as in North Latitude with North Declination, as alſo in North Latitude with South Declination.

There

Therefore thoſe Tables are as uſeful in South Latitude as in North Latitude; if North Declination in theſe Tables be counted for South, and South for North.

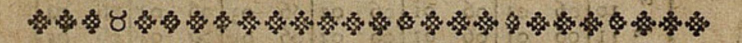
Note 4. The Riſing, Setting, and Amplitude of any Star (whoſe Declination doth not exceed the Sun's greateſt Declination) may be found by theſe Tables; provided it's Southing, or Time of the Star's coming to or on the Meridian, be known.

For the Time of Sun-ſetting in theſe Tables for any Latitude, is a Star's half Continuance above the Horizon, having equal Declination, and the ſame kind with the Sun for the ſame Latitude.

Therefore the half Continuance of a Star above the Horizon (found in theſe Tables as before directed) added to, and ſubtracted from the Time of the Star's coming to or on the Meridian; the firſt is the Star's Setting, and the latter it's Riſing.

Examples of this Nature you will find in the Uſe of the next Tables of Semidiurnal and Seminocturnal Arches, to which you are referred.

The Amplitude of a Star by the foregoing Tables is found as the Amplitude of the Sun was, which is more fully treated on in the Uſe of the Table of Amplitude in Page 146.



Aſtronomic TABLES of Semidiurnal and Seminocturnal Arches: Shewing the true Time of the Sun's Riſing and Setting; with the Length of the Day and Night, for any Day in the Year; fitting all Places in the World, where the Pole is not elevated above 60 Degrees, either North or South; and to laſt with Exactneſs, as long as God upholdeth the Courſe of Nature.

A TABLE ſhewing the Semidiurnal Arch, or Time of Sun-ſetting, when the Sun hath North Declination; and the Seminoctural Arch, or Time of Sun-riſing, when the Sun hath South Declination.

	The Degrees of Latitude.											
Sun's Decli	1		2		3		4		5		6	
	H	M	H	M	H	M	H	M	H	M	H	M
0	06	00	06	00	06	00	06	00	06	00	06	00
1	06	00	06	00	06	00	06	00	06	00	06	00
2	06	00	06	00	06	00	06	00	06	01	06	01
3	06	00	06	00	06	01	06	01	06	01	06	01
4	06	00	06	00	06	01	06	01	06	01	06	02
5	06	00	06	00	06	01	06	01	06	02	06	02
6	06	00	06	01	06	01	06	02	06	02	06	03
7	06	00	06	01	06	01	06	02	06	02	06	03
8	06	00	06	01	06	02	06	02	06	03	06	03
9	06	01	6	01	06	02	06	03	06	03	06	04
10	06	01	06	01	06	02	06	03	06	04	06	04
11	06	01	06	01	06	02	06	03	06	04	06	05
12	06	01	06	02	06	02	06	03	06	04	06	05
13	06	01	06	02	06	03	06	04	06	05	06	06
14	06	01	06	02	06	03	06	04	06	05	06	06
15	06	01	06	02	06	03	06	04	06	05	06	06
16	06	01	06	02	06	03	06	05	06	06	06	07
17	06	01	06	02	06	04	06	05	06	06	06	07
18	06	01	06	03	06	04	06	05	06	07	06	08
19	06	01	06	03	06	04	06	05	06	07	06	08
20	06	01	06	03	06	04	06	06	06	07	06	09
21	06	02	06	03	06	05	06	06	06	08	06	09
22	06	02	06	03	06	05	06	06	06	08	06	10
23	06	02	06	03	06	05	06	07	06	09	06	10
23.29	06	02	06	04	06	05	06	07	06	09	06	11

Degrees of Declination.

A TABLE ſhewing the Semidiurnal Arch, or Time of Sun-ſetting, when the Sun hath North Declination; and the Seminocturnal Arch, or Time of Sun-riſing, when the Sun hath South Declination.

The Degrees of Latitude.

Sun's Decli. (Degrees of Declination.)	7		8		9		10		11		12	
	H	M	H	M	H	M	H	M	H	M	H	M
0	06	00	06	00	06	00	06	00	06	00	06	00
1	06	00	06	00	06	01	06	01	06	01	06	01
2	06	01	06	01	06	01	06	01	06	02	06	02
3	06	01	06	02	06	02	06	02	06	02	06	03
4	06	02	06	02	06	02	06	03	06	03	06	04
5	06	02	06	03	06	03	06	04	06	04	06	04
6	06	03	06	03	06	04	06	04	06	05	06	05
7	06	03	06	04	06	04	06	05	06	05	06	06
8	06	04	06	04	06	05	06	06	06	06	06	07
9	06	04	06	05	06	06	06	06	06	07	06	08
10	06	05	06	06	06	06	06	07	06	08	06	09
11	06	05	06	06	06	07	06	08	06	09	06	09
12	06	06	06	07	06	08	06	09	06	09	06	10
13	06	06	06	07	06	08	06	09	06	10	06	11
14	06	07	06	08	06	09	06	10	06	11	06	12
15	06	08	06	09	06	10	06	11	06	12	06	13
16	06	08	06	09	06	10	06	12	06	13	06	14
17	06	09	06	10	06	11	06	12	06	14	06	15
18	06	09	06	10	06	12	06	13	06	14	06	16
19	06	10	06	11	06	13	06	14	06	15	06	17
20	06	10	06	12	06	14	06	15	06	16	06	18
21	06	11	06	12	06	14	06	16	06	17	06	19
22	06	11	06	13	06	15	06	16	06	18	06	20
23	06	12	06	14	06	15	06	17	06	19	06	21
23.29	06	12	06	14	06	16	06	17	06	19	06	21

A TABLE ſhewing the Semidiurnal Arch, or Time of Sun-ſetting, when the Sun hath North Declination; and the Seminocturnal Arch, or Time of Sun-riſing, when the Sun hath South Declination.

Sun's Decli. Degrees of Declination.	The Degrees of Latitude. 13 H	13 M	14 H	14 M	15 H	15 M	16 H	16 M	17 H	17 M	18 H	18 M
0	06	00	06	00	06	00	06	00	06	00	06	00
1	06	01	06	01	06	01	06	01	06	01	06	01
2	06	02	06	02	06	02	06	02	06	02	06	02
3	06	03	06	03	06	03	06	03	06	04	06	04
4	06	04	06	04	06	04	06	05	06	05	06	05
5	06	05	06	05	06	05	06	06	06	06	06	06
6	06	06	06	06	06	06	06	07	06	07	06	08
7	06	06	06	07	06	07	06	08	06	09	06	09
8	06	07	06	08	06	09	06	09	06	10	06	10
9	06	08	06	09	06	10	06	10	06	11	06	12
10	06	09	06	10	06	11	06	12	06	12	06	13
11	06	10	06	11	06	12	06	13	06	13	06	14
12	06	11	06	12	06	13	06	14	06	15	06	16
13	06	12	06	13	06	14	06	15	06	16	06	17
14	06	13	06	14	06	15	06	16	06	17	06	19
15	06	14	06	15	06	16	06	18	06	19	06	20
16	06	15	06	16	06	18	06	19	06	20	06	21
17	06	16	06	17	06	19	06	20	06	21	06	22
18	06	17	06	19	06	20	06	21	06	24	06	24
19	06	18	06	20	06	21	06	23	06	24	06	26
20	06	19	06	21	06	22	06	24	06	25	06	27
21	06	20	06	22	06	24	06	25	06	27	06	29
22	06	21	06	23	06	25	06	27	06	28	06	30
23	06	22	06	24	06	26	06	28	06	30	06	32
23:29	06	23	06	25	06	27	06	29	06	31	06	33

A TABLE ſhewing the Semidiurnal Arch, or Time of Sun-ſetting, when the Sun hath North Declination; and the Seminocturnal Arch, or Time of Sun-riſing, when the Sun hath South Declination.

The Degrees of Latitude.

Sun's Decli. Degrees of Declination.	19		20		21		22		23		24	
	H	M	H	M	H	M	H	M	H	M	H	M
0	06	00	06	00	06	00	06	00	06	00	06	00
1	06	01	06	01	06	01	06	02	06	02	06	02
2	06	03	06	03	06	03	06	03	06	03	06	03
3	06	04	06	04	06	05	06	05	06	05	06	05
4	06	05	06	06	06	06	06	06	06	07	06	07
5	06	07	06	07	06	08	06	08	06	09	06	09
6	06	08	06	09	06	09	06	10	06	10	06	11
7	06	10	06	10	06	11	06	11	06	12	06	13
8	06	11	06	12	06	12	06	13	06	14	06	14
9	06	13	06	13	06	14	06	15	06	15	06	16
10	06	14	06	15	06	16	06	16	06	17	06	18
11	06	15	06	16	06	17	06	18	06	19	06	20
12	06	17	06	18	06	19	06	20	06	21	06	22
13	06	18	06	19	06	20	06	21	06	23	06	24
14	06	20	06	21	06	22	06	23	06	24	06	25
15	06	21	06	22	06	24	06	25	06	26	06	27
16	06	23	06	24	06	25	06	27	06	28	06	29
17	06	24	06	25	06	27	06	28	06	30	06	31
18	06	26	06	27	06	29	c6	30	06	32	06	33
19	06	27	06	29	06	30	06	32	06	34	06	35
20	06	28	06	30	06	32	06	34	06	36	06	37
21	06	30	06	32	06	34	06	36	06	37	06	39
22	06	31	06	33	06	35	06	37	06	39	06	41
23	06	33	06	35	06	37	06	39	06	41	06	43
23.29	06	34	06	36	06	38	06	40	06	42	06	44

A TABLE shewing the Semidiurnal Arch, or Time of Sun-setting, when the Sun hath North Declination; and the Seminocturnal Arch, or Time of Sun-rising, when the Sun hath South Declination.

The Degrees of Latitude.

Sun's Decli.	25 H	25 M	26 H	26 M	27 H	27 M	28 H	28 M	29 H	29 M	30 H	30 M
0	06	00	06	00	06	00	06	00	06	00	06	00
1	06	02	06	02	06	02	06	02	06	02	06	02
2	06	04	06	04	06	04	06	04	06	04	06	05
3	06	06	06	06	06	06	06	06	06	07	06	07
4	06	07	06	08	06	08	06	09	06	09	06	09
5	06	09	06	10	06	10	06	11	06	11	06	12
6	06	11	06	12	06	12	06	13	06	13	06	14
7	06	13	06	14	06	14	06	15	06	16	06	16
8	06	15	06	16	06	16	06	17	06	18	06	19
9	06	17	06	18	06	19	06	19	06	20	06	21
10	06	19	06	20	06	21	06	22	06	23	06	23
11	06	21	06	22	06	23	06	24	06	25	06	26
12	06	23	06	24	06	25	06	26	06	27	06	28
13	06	25	06	26	06	27	06	28	06	29	06	31
14	06	27	06	28	06	29	06	30	06	32	06	33
15	06	29	06	30	06	31	06	33	06	34	06	36
16	06	31	06	32	06	34	06	35	06	37	06	38
17	06	33	06	34	06	36	06	37	06	39	06	41
18	06	35	06	36	06	38	06	40	06	42	06	43
19	06	37	06	39	06	40	06	42	06	44	06	46
20	06	39	06	41	06	43	06	45	06	47	06	48
21	06	41	06	43	06	45	06	47	06	49	06	51
22	06	43	06	45	06	48	06	50	06	52	06	54
23	06	46	06	48	06	50	06	52	06	54	06	57
23.29	06	47	06	49	06	51	06	53	06	55	06	58

Degrees of Declination.

A TABLE ſhewing the Semidiurnal Arch, or Time of Sun-ſetting, when the Sun hath North Declination; and the Seminocturnal Arch, or Time of Sun-riſing, when the Sun hath South Declination.

The Degrees of Latitude.

Sun's Decli	31		32		33		34		35		36	
	H	M	H	M	H	M	H	M	H	M	H	M
0	06	00	06	00	06	00	06	00	06	00	06	00
1	06	02	06	02	06	03	06	03	06	03	06	03
2	06	05	06	05	06	05	06	05	06	06	06	06
3	06	07	06	08	06	08	06	08	06	08	06	09
4	06	10	06	10	06	10	06	11	06	11	06	12
5	06	12	06	13	06	13	06	14	06	14	06	15
6	06	15	06	15	06	16	06	16	06	17	06	18
7	06	17	06	18	06	18	06	19	06	20	06	20
8	06	19	06	20	06	21	06	22	06	23	06	23
9	06	22	06	23	06	24	06	25	06	25	06	26
10	06	24	06	25	06	26	06	27	06	28	06	29
11	06	27	06	28	06	29	06	30	06	31	06	32
12	06	29	06	31	06	32	06	33	06	34	06	36
13	06	32	06	33	06	34	06	36	06	37	06	39
14	06	34	06	36	06	37	06	39	06	40	06	42
15	06	37	06	39	06	40	06	42	06	43	06	45
16	06	40	06	41	06	43	06	45	06	46	06	48
17	06	42	06	44	06	46	06	48	06	49	06	51
18	06	45	06	47	06	49	06	51	06	53	06	55
19	06	48	06	50	06	52	06	54	06	56	06	58
20	06	51	06	53	06	55	06	57	06	59	07	01
21	06	53	56	06	06	58	07	00	07	02	07	05
22	06	56	56	08	07	01	07	03	07	06	07	08
23	06	59	07	01	07	04	07	06	07	09	07	12
23.29	07	01	07	03	07	06	07	08	07	11	07	14

Degrees of Declination.

A TABLE ſhewing the Semidiurnal Arch, or Time of Sun-ſetting, when the Sun hath North Declination; and the Seminocturnal Arch, or Time of Sun-riſing, when the Sun hath South Declination.

The Degrees of Latitude.

Sun's Decli.	37		38		39		40		41		42	
	H	M	H	M	H	M	H	M	H	M	H	M
0	06	00	06	00	06	00	06	00	06	00	06	00
1	06	03	06	03	06	03	06	03	06	03	06	04
2	06	06	06	06	06	06	06	07	06	07	06	07
3	06	09	06	09	06	10	06	10	06	10	06	11
4	06	12	06	13	06	13	06	13	06	14	06	14
5	06	15	06	16	06	16	06	17	06	17	06	18
6	06	18	06	19	06	20	06	20	06	21	06	22
7	06	21	06	22	06	23	06	24	06	25	06	25
8	06	24	06	25	06	26	06	27	06	28	06	29
9	06	27	06	28	06	29	06	31	06	32	06	33
10	06	31	09	32	06	32	06	34	06	35	06	37
11	06	34	06	35	06	36	06	38	06	39	06	40
12	06	37	06	38	06	40	06	41	06	43	06	44
13	06	40	06	42	06	43	06	45	06	46	06	48
14	06	43	06	45	06	47	06	48	06	50	06	52
15	06	47	06	48	06	50	06	52	06	54	06	56
16	06	50	06	52	06	54	06	56	06	58	07	00
17	06	53	06	55	06	57	07	00	07	02	07	04
18	06	57	06	59	07	01	07	03	07	06	07	08
19	07	00	07	02	07	05	07	07	07	10	07	12
20	07	04	07	06	07	09	07	11	07	14	07	17
21	07	07	07	10	07	12	07	15	07	18	07	21
22	07	11	07	14	07	16	07	19	07	22	07	25
23	07	15	07	17	07	20	07	23	07	27	07	30
23.29	07	17	07	19	07	22	07	25	07	29	07	32

Degrees of Declination.

A TABLE shewing the Semidiurnal Arch, or Time of Sun-setting, when the Sun hath North Declination; and the Seminocturnal Arch, or Time of Sun-rising, when the Sun hath South Declination.

The Degrees of Latitude.

Sun's Decli (Degrees of Declination.)	43		44		45		46		47		48	
	H	M	H	M	H	M	H	M	H	M	H	M
0	06	00	06	00	06	00	06	00	06	00	06	00
1	06	04	06	04	06	04	06	04	06	04	06	04
2	06	07	06	08	06	08	06	08	06	09	06	09
3	06	11	06	12	06	12	06	12	06	13	06	13
4	06	15	06	5	06	16	06	17	06	17	06	18
5	06	19	06	19	06	20	06	21	06	22	06	22
6	09	22	06	23	06	24	06	25	06	26	06	27
7	06	26	06	27	06	28	06	29	06	30	06	31
8	06	30	06	31	06	32	06	33	06	35	06	36
9	06	34	06	35	06	36	06	38	06	39	06	41
10	06	38	06	39	06	41	06	42	06	43	06	45
11	06	42	06	43	06	45	06	46	06	48	06	50
12	06	46	06	47	06	49	06	51	06	53	06	55
13	06	50	06	52	06	53	06	55	06	57	06	59
14	06	54	06	56	06	58	07	00	07	02	07	04
15	06	58	07	00	07	02	07	04	07	07	07	09
16	07	02	07	04	07	07	07	09	07	12	07	14
17	07	06	07	09	07	11	07	14	07	17	07	19
18	07	11	07	13	07	16	07	19	07	22	07	25
19	07	15	07	18	07	21	07	24	07	27	07	30
20	07	19	07	22	07	25	07	29	07	32	07	35
21	07	24	07	27	07	30	07	34	07	37	07	41
22	07	28	07	31	07	35	07	39	07	43	07	47
23	07	33	07	36	07	40	02	44	07	48	07	53
23.29	07	36	07	39	07	43	07	47	07	51	07	56

A TABLE shewing the Semidiurnal Arch, or Time of Sun-setting, when the Sun hath North Declination; and the Seminocturnal Arch, or Time of Sun-rising, when the Sun hath South Declination.

The Degrees of Latitude.

Sun's Decli.	49		50		51		52		53		54	
	H	M	H	M	H	M	H	M	H	M	H	M
0	06	00	06	00	06	00	06	00	06	00	06	00
1	06	05	06	05	06	05	06	05	06	05	06	06
2	06	09	06	10	06	10	06	10	06	11	06	11
3	06	14	06	14	06	15	06	15	06	16	06	17
4	06	18	06	19	06	20	06	21	06	21	06	22
5	06	23	06	24	06	25	06	26	06	27	06	28
6	06	28	06	29	06	30	06	31	06	32	06	33
7	06	32	06	34	06	35	06	36	06	38	06	39
8	06	37	06	39	06	40	06	41	06	43	06	45
9	06	42	06	44	06	45	06	47	06	49	06	50
10	06	47	06	49	06	50	06	52	06	54	06	56
11	06	52	06	54	06	56	06	58	07	00	07	02
12	06	57	06	59	07	01	07	03	07	06	07	08
13	07	02	07	04	07	06	07	09	07	11	07	14
14	07	07	07	09	07	12	07	14	07	17	07	20
15	07	12	07	14	07	17	07	20	07	23	07	27
16	07	17	07	20	07	23	07	26	07	29	07	33
17	07	22	07	25	07	29	07	32	07	36	07	40
18	07	28	07	31	07	35	07	38	07	42	07	46
19	07	33	07	37	07	41	07	45	07	49	07	52
20	07	39	07	43	07	47	07	51	07	56	08	00
21	07	45	07	49	07	53	07	58	08	03	08	08
22	07	51	07	55	08	00	08	05	08	10	08	15
23	07	57	08	02	08	06	08	12	08	17	08	23
23.29	08	00	08	05	08	10	08	16	08	21	08	27

Degrees of Declination.

A TABLE ſhewing the Semidiurnal Arch, or Time of Sun-ſetting, when the Sun hath North Declination; and the Seminocturnal Arch, or Time of Sun riſing, when the Sun hath South Declination.

The Degrees of Latitude.

Sun's Decli. (Degrees of Declination.)	55		56		57		58		59		60	
	H	M	H	M	H	M	H	M	H	M	H	M
0	06	00	06	00	06	00	06	00	06	00	06	00
1	06	06	06	06	06	06	06	06	06	07	06	07
2	06	11	06	12	06	12	06	13	06	13	06	14
3	06	17	06	18	06	19	06	19	06	20	06	21
4	06	23	06	24	06	25	06	26	06	27	06	28
5	06	29	07	30	06	31	06	32	06	33	06	35
6	06	35	07	36	06	37	06	39	06	40	06	42
7	06	40	07	42	06	44	06	45	06	47	06	49
8	06	46	07	48	06	50	06	52	06	54	06	56
9	06	52	07	54	06	56	06	59	07	01	07	04
10	06	58	07	00	07	03	07	06	07	08	07	11
11	07	04	07	07	07	10	07	13	07	16	07	19
12	07	11	07	13	07	16	07	20	07	23	07	26
13	07	17	07	20	07	23	07	27	07	30	07	34
14	07	23	07	27	07	30	07	34	07	38	07	42
15	07	30	07	34	07	38	07	42	07	46	07	51
16	07	37	07	41	07	45	07	49	07	54	07	59
17	07	44	07	48	07	52	07	57	08	03	08	08
18	07	51	07	55	08	00	08	05	08	11	08	17
19	07	58	08	03	08	08	08	14	08	20	08	26
20	08	05	08	11	08	16	08	22	08	29	08	36
21	08	13	08	19	08	25	08	32	08	39	08	47
22	08	21	08	27	08	34	08	41	08	49	08	58
23	08	29	08	32	08	43	08	51	09	00	09	09
23.29	08	33	08	41	08	48	08	56	09	05	09	16

The USE of the foregoing TABLES of Semidiurnal and Seminocturnal Arches.

To find the Time of the Sun's Rifing and Setting, and the Length of the Day, and Night, by thefe Tables.

FIRST, feek the Sun's Declination in the Tables of Declination for the Day propofed; with which enter the Tables of Semidiurnal and Seminocturnal Arches; finding the Latitude of the Place in the Head of the Table, and the Degrees of the Sun's Declination in the firft Column on the Left-hand; and in the common Angle of Meeting is the Semidiurnal Arch, if the Sun hath North Declination; but it's Seminocturnal Arch, if the Sun hath South Declination.

Example 1. For Illuftration hereof, let it be required to find the Time of the Sun's Rifing and Setting, the Length of the Day and Night, for the 4th Day of May, 1778, in Latitude 46 Degrees North.

At which Time the Sun's Declination is 16 deg. 3 min. North; with which enter the Table, as is before declared, and the Semidiurnal Arch is 7 Hours 9 Min. the true Time of Sun-fetting; whofe Complement to 12 Hours is the Seminocturnal Arch, or the Time of the Sun-rifing, and is 4 Hours 51 Minutes; double the Semidiurnal Arch you have the Length of the Day; double the Seminocturnal Arch, the Aggregate is the Length of the Night. See the Work following.

	H. M.
	12 : 00
The Semidiurnal Arch, or Time of Sun-fetting -	07 : 09
The Complement to 12 Hours is - - - - -	04 : 51

The Seminocturnal Arch, or Time of Sun-rifing, in Latitude 46 Degrees North, is 4 Hours 51 Minutes.

The

	H. M.
The Semi-diurnal Arch double - - - - -	07 : 09 07 : 09
The Length of the Day, May 4, 1786, is	14 : 18
The Semi-nocturnal Arch doubled - - - - -	04 : 51 04 : 51
The Length of the Night, May 4, 1786, is ———	09 : 42

Example 2. But when the Sun hath 16 deg. 03 min. South Declination, in the Latitude of 46 deg. North; then the Day Arch will become the Night Arch, and the Night-Arch will become the Day-Arch.

As, on Nov, 6, 1783, the Sun hath 16 deg. 02 min. South Declination; then the Time of the Sun's Rising is 7 Hours 9 Minutes, his Setting 4 Hours 51 Minutes; the Length of the Day 9 Hours 42 Minutes, and the Length of the Night 14 Hours 18 Minutes.

Example 3. Let it be required to find the Time of the Sun's Rising and Setting, with the Length of the Day and Night from the 26th of December, 1787, in Latitude 53 deg North; at which Time the Sun's Declination is 23 deg. 23 min. South.

	H. M.
	12 : 60
The Seminocturnal Arch, or Time of Sun-rising —	08 : 20
The Complement to 12 Hours is - - - - - -	03 : 40

And is the Semidiurnal Arch, or Time of Sun-setting.

The Semidiurnal Arch doubled - - - - -	03 : 40 03 : 40
The Length of the Day, December 26, 1777, is	07 : 20
The Seminocturnal Arch doubled - - - -	08 : 20 08 : 20
The Length of the Night, Dec. 26, 1787, ——	16 : 40

The

Theſe Tables will ſerve as well in South Latitude as in North, with this Alteration only: When in South Latitude, then uſe South Declination there, as you do North Declination here in North Latitude.

For then theſe Tables ſhew the Semidiurnal Arch, or the Time of Sun-riſing, when the Sun hath South Declination; and the Seminocturnal Arch, or the Time of Sun-ſetting, when the Sun hath North Declination.

Example 4. Let it be required to find the Time of the Sun's Riſing and Setting, with the Length of the Day and Night, for the 4th of May, 1787, in Latitude 46 Degrees South.

At which Time the Sun's Declination is 16 Degrees 00 Minutes North; with which enter the Table, and the Seminocturnal Arch is 7 Hours 9 Minutes the Time of Sun riſing; whoſe Complement 12 Hours is the Semidiurnal Arch, or Time of Sun-ſetting, which is at 51 Minutes paſt 5 of the Clock.

	H. M.
The Seminocturnal doubled ————	07 : 09 07 : 09
The Length of the Night, May, 4, 1787, in Latitude 46 Degrees South ————	14 : 18
The Semidiurnal Arch doubled ————	04 : 51 04 : 51
The Length of the Day, the 4th of May, 1787. Latitude 46 Degrees South ——	09 : 42

Example 5. Let it be required to find the Time of the Sun's Riſing and Setting, with the Length of the Day and Night, for the 11th of December, 1783 in Latitude 53 Degrees South. At which Time the Sun's Declination is 23 deg. 3 min. South; with which enter the Table of Semidiurnal Arches, *&c.* and you will find as follows.

H. M.

	H. M.
	12 : 00
The Semidiurnal Arch, or Time of Sun-ſetting	08 : 17
The Seminocturnal Arch, or Time of Sun-riſing	03 : 43
The Length of the Day	16 : 34
Length of the Night, December 11, 1783 Latitude 53 Degrees South	07 : 26

To find the Time of a Star's Riſing or Setting.

BY theſe Tables the Time of the Riſing and Setting of all the Stars in the Heavens (whoſe Declination do not exceed the Sun's greateſt Declination,) in any Latitude that the Tables contain, and at any Time of the Year, is found in this Manner.

If the Star hath North Declination, and you are in North Latitude, look for the Latitude in the Head of the Table, the Declination on the Left-hand, and in the common Angle of Meeting is the Star's Semiapparent Arch, or half the Time of the Star's Continuance above the Horizon, in that Latitude; or the ſpace of Time which that Star takes in aſcending from the Horizon to the Meridian, on the Eaſt-ſide; likewiſe deſcending from the Meridian, to the Horizon, on the Weſt-ſide of the Meridian. Now, if you ſubtract theſe Hours and Minutes from the Time of the Star's coming to the Meridian, the Remainder will be the Time of the Star's Riſing: And if you add, the Sum will be the true Time of the Star's Setting.

Example 6. Let it be required to find the Time of the Riſing and Setting of the *Bull's Eye*, November the 30th in the Latitude of 52 Degrees North: The Declination of the Star is 16 deg. North; the 30th Day of November this Star cometh on the Meridian at 56 Minutes paſt 11 of the Clock at Night.

H. M.

	H. M.
The Time of the Star's Southing - - - - - -	11 : 56
The Semi-apparent Arch, subtract - - - -	07 : 26
The Time of the Star's Rising in the Evening -	04 : 30
Time of the Star's Setting in the Morning - -	07 : 22

Note 1. If the Sum of the Addition exceed 12 Hours, cast away 12 Hours; the Surplus is the Star's Setting.

2. And when you can't subtract, add 12 Hours to the Star's Southing, and then subtract: What remains is it's Rising.

Example 7. I desire to know the Time of the Rising and Setting of the Bull's Eye, the 30th Day of November, in the Latitude of 13 Degrees North: The Declination of the Bull's Eye 16 deg. North?

	H. M.
The Time of the Star's Southing - - - - - -	11 : 56
The Semi-apparent Arch, subtract - - - -	06 : 15
The Time of his Rising in the Evening - - -	05 : 41
The Time of his Setting in the Morning - -	06 : 11

If the Star hath South Declination, and you are in North Latitude, look (as before) the Latitude in the Head of the Table, the Declination on the Left-side, and in the common Angle of Meeting is the Star's Semi-depressed Arch: which subtract from 12 Hours, the Remainder is the Star's Semi-apparent Arch, or half the Time that the Star doth continue above the Horizon in that Latitude: Therefore subtract those Hours and Minutes from the Time of the Star's coming to the Meridian, adding 12 Hours to the Star's Southing, if otherwise Subtraction cannot be made, the Remainder will be the Time of the Star's Rising; and if you add, the Sum will be the Time of the Star's Setting.

Example

Example 8. Let it be required to find the Time of the Riſing and Setting of the Bright Star in the *Great Dog's Mouth*, the 15th Day of *November*, in the Latitude of 50 deg. North. The Declination of the *Great Dog's Mouth*, is 16d. 24m. South, and its Southing is 3 Hours, 12 min. in the Morning, the 25th of *November*.

	H. M.
The Time of the Star's Southing is - - - -	03 : 12
To it add - - - - - - - - - - - - - -	12 : 00
The Sum is - - - - - - - - - - - - - -	15 : 12
The Semi-depreſſed Arch, by the Table is - -	07 : 22
Which ſubtract from - - - - - - - - -	12 : 00
The Remainder is the Semi-apparant Arch -	04 : 38
Time of Southing with 12 Hours added is - -	15 - 12
The Semi-apparent Arch ſubtract - - - -	04 : 38
Time of the Star's Riſing in the Evening - -	10 : 34
Time of the Star's Setting from Noon, or 50 min. paſt 7 in the Morning - - - -	19 : 50

Example 9. I deſire to know the Riſing and Setting of the *Great Dog*, the 15th of *November*, in the Latitude of 30 Degrees North.

	H. M.
Time of Southing with 12 Hours added - -	15 : 12
The Semi-depreſſed Arch, by the Table, is -	6 : 39
Subtract from - - - - - - - - - - - - -	12 : 00
Remainder of the Semi-apparent Arch - - -	5 : 21
Time of Southing, with 12 Hours added, is -	15 : 12
Subtract, gives the Time of the Star's riſing in the Evening - - - - - - - - -	9 : 51
Added, gives the Star's ſetting in the Morning, when 12 Hours are ſubtracted - - -	8 : 33

In South Latitude, to know the Time of Riſing and Setting of the Stars.

Proceed with thoſe Stars that hath North Delination in South Latitude, as with Stars that have South Declination in North Latitude.

Example 10. Let it be required to find the Time of the Riſing and Setting of the *Bull's Eye* the 18th Day of *November*, in the Latitude of 42 Degrees South.

The Declination of this Star is 16 Deg. 00 min North: the 18th Day of *November*, this Star cometh upon the Meridian at 47 min. paſt 12 in the Morning.

	H. M.
The Semi-depreſs'd Arch, by the Table is ——	07 : 08
Which ſubtract from ——————	12 : 00
The Remainder is the Semi-apparent Arch ——	04 : 52
The Time of the Star's Northing is ————	12 : 47
The Semi-apparent Arch, ſubtract ———	04 : 52
Time of the Star's Riſing in the Evening ——	07 : 47
Time of the Star's Setting in the Morning ——	05 : 47

In like Manner the riſing and Setting of any Star (whoſe Declination exceedeth not the Sun's greateſt) may be found in any Latitude, from the Equinoctial to 60 Degrees, either North or South.

ASTRONOMIC

TABLES,

Shewing the Points of the Compaſs, *the* Sun *and* Stars *Riſe and Set upon.*

Being of excellent Uſe for readily finding the Variation of the Compaſs; and may be performed by an ordinary Meridian Compaſs, but more exactly by an Azimuth Compaſs.

Fitting all Parts of the World, where the Pole is not elevated above 60 Deg. either North or South.

Latitude 0 Degree.

North Dec.		Dec.	South Dec.	
☉ ri	☉ set	d. m.	☉ ri	☉ set
East	West	0.00	East	West
1		2.49	1	
2		5.37	2	
3		8.26	3	
ebn	wbn	11.15	ebs	wbs
1		14.04	1	
2		16.52	2	
3		19.41	3	
ene	wnw	22.30	ese	wsw

Latitude 1 Degree

North Dec.		Dec.	South Dec.	
☉ ri	☉ set	d. m.	☉ ri	☉ set
East	West	0.00	East	West
1		2.49	1	
2		5.37	2	
3		8.26	3	
ebn	wbn	11.15	ebs	wbs
1		14.04	1	
2		16.52	2	
3		19.41	3	
ene	wnw	22.30	ese	wsw

Latitude 2 Degrees.

North Dec.		Dec.	South Dec.	
☉ ri	☉ set	d. m.	☉ ri	☉ set
East	West	0.00	East	West
1		2.49	1	
2		5.37	2	
3		8.26	3	
ebn	wbn	11.15	ebs	wbs
1		14.04	1	
2		16.52	2	
3		19.40	3	
ene	wnw	22.29	ese	wsw

Latitude 3 Degrees.

North Dec.		Dec.	South Dec.	
☉ ri	☉ set	d. m.	☉ ri	☉ set
East	West	0.00	East	West
1		2 49	1	
2		5.37	2	
3		8.25	3	
ebn	wbn	11,14	ebs	wbs
1		14.03	1	
2		16.51	2	
3		19.39	3	
ene	wnw	22.27	ese	wsw

Latitude 4 Degrees.

North Dec.	Dec.	South Dec.
☉ ri | ☉ ſet	d. m.	☉ ri | ☉ ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	2.48	1
2	5.37	2
3	8.25	3
e b n w b n	11.14	e b s w b s
1	14.02	1
2	16.50	2
3	19.38	3
ene wnw	22.25	e s e w s w

Latitude 5 Degrees

North Dec.	Dec.	South Dec.
☉ ri | ☉ ſet	d. m.	☉ ri | ☉ ſet
Eaſt Weſt	0.00	Eaſt Weſt.
1	2.48	1
2	5.36	2
3	8.24	3
e b n w b n	11.12	e b s w b s
1	13.01	1
2	16.49	2
3	19.36	3
ene wnw	22.23	e s e w s w

Latitude 6 Degrees.

North Dec.	Dec.	South Dec.
☉ ri | ☉ ſet	d. m.	☉ ri | ☉ ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	2.48	1
2	5.36	2
3	8.23	3
e b n w b n	11.11	e b s w b s
1	13.59	1
2	16.47	2
3	19.32	3
ene wnw	22.21	e s e w s w

Latitude 7 Degrees.

North Dec.	Dec.	South Dec.
☉ ri | ☉ ſet	d. m.	☉ ri | ☉ ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	2.48	1
2	5.35	2
3	8.22	3
e b n w b n	11.09	e b s w b s
1	13.57	1
2	16.45	2
3	19.32	3
ene wnw	22.19	e s e w s w

Latitude 8 Degree.

NorthDec		Dec.	South Dec.	
☉ri	☉set	d. m.	☉ri	☉set
East	West	0.00	East	West
1		2.47	1	
2		5.35	2	
3		8.21	3	
ebn	wbn	11.08	ebs	wbs
1		13.55	1	
2		16.42	2	
3		19.29	3	
ene	wnw	21.16	ese	wsw

Latitude 9 Degree

NorthDec.		Dec.	South Dec.	
☉ri	☉set	d. m.	☉ri	☉set
East	West	0.00	East	West
1		2.47	1	
2		5.33	2	
3		8.20	3	
ebn	wbn	11.06	ebs	wbs
1		13.53	1	
2		16.40	2	
3		19.26	3	
ene	wnw	22.12	ese	wsw

Latitude 10 Degrees.

NorthDec.		Dec.	South Dec.	
☉ri	☉set	d. m.	☉ri	☉set
East	West	0.00	East	West
1		2.46	1	
2		5.32	2	
3		8.18	3	
ebn	wbn	11.04	ebs	wbs
1		13.50	1	
2		16.37	2	
3		19.22	3	
ene	wnw	21.08	ese	wsw

Latitude 11 Degrees.

NorthDec.		Dec.	South Dec.	
☉ri	☉set	d. m.	☉ri	☉set
East	West	0.00	East	West
1		2 46	1	
2		5.31	2	
3		8.17	3	
ebn	wbn	11,03	ebs	wbs
1		13.48	1	
2		16.33	2	
3		19.18	3	
ene	wnw	22.03	ese	wsw

Latitude 12 Degrees.		
North Dec.	Dec.	South Dec.
☉ ri | ☉ set	d. m.	☉ ri | ☉ set
East West	0.00	East West
1	2.45	1
2	5.30	2
3	8.15	3
e b n w b n	11.00	e b s w b s
1	13.45	1
2	16.30	2
3	19.14	3
e n e w n w	21.58	e s e w s w

Latitude 13 Degrees		
North Dec.	Dec.	South Dec.
☉ ri | ☉ set	d. m.	☉ ri | ☉ set
East West	0.00	East West.
1	2.45	1
2	5.29	2
3	8.13	3
e b n w b n	10.57	e b s w b s
1	13.42	1
2	16.26	2
3	19.10	3
e n e w n w	21.52	e s e w s w

Latitude 14 Degrees.		
North Dec.	Dec.	South Dec.
☉ ri | ☉ set	d. m.	☉ ri | ☉ set
East West	0.00	East West
1	2.44	1
2	5.28	2
3	8.11	3
e b n w b n	10.55	e b s w b s
1	13.38	1
2	16.22	2
3	19.04	3
e n e w n w	21.47	e s e w s w

Latitude 15 Degrees.		
North Dec.	Dec.	South Dec
☉ ri | ☉ set	d. m.	☉ ri | ☉ set
East West	0.00	East West
1	2.43	1
2	5.26	2
3	8.09	3
e b n w b n	10.52	e b s w b s
1	13.35	1
2	16.17	2
3	18.59	3
e n e w n w	21.41	e s e w s w

Latitude 16 Degrees.

North Dec.		Dec.	South Dec.	
☉ri	☉ſet	d. m.	☉ri	☉ſet
Eaſt	Weſt	0.00	Eaſt	Weſt
1		2.42	1	
2		5.25	2	
3		8.06	3	
ebn	wbn	10.49	ebs	wbs
1		13.31	1	
2		16.12	2	
3		18.53	3	
ene	wnw	21.34	ese	wsw

Latitude 17 Degrees.

North Dec		Dec.	South Dec.	
☉ri	☉ſet	ɯ ·p·	☉ri	☉ſet
Eaſt	Weſt	0.00	Eaſt	Weſt
1		2.42	1	
2		5.23	2	
3		8.04	3	
ebn	wbn	10.46	ebs	wbs
1		13.29	1	
2		16.08	2	
3		18.47	3	
ene	wnw	21.27	ese	wsw

Latitude 18 Degrees.

North Dec.		Dec.	South Dec.	
☉ri	☉ſet	d.m.	☉ri	☉ſet
Eaſt	Weſt	0.00	Eaſt	Weſt
1		2.41	1	
2		5.21	2	
3		8.01	3	
ebn	wbn	10.42	ebs	wbs
1		13.22	1	
2		16.02	2	
3		18.40	3	
en	ewnw	21.20	ese	wsw

Latitude 19 Degrees.

North Dec.		Dec.	South Dec.	
☉ri	☉ſet	d.m.	☉ri	☉ſet
Eaſt	Weſt	0.00	Eaſt	Weſt
1		2.40	1	
2		5.19	2	
3		7.58	3	
ebn	wbn	10.38	eb	wbs
1		13.17	1	
2		15.56	2	
3		18.34	3	
ene	wnw	21.27	ese	wsw

Latitude 20 Degrees.

NorthDec.	Dec.	South Dec.
⊙ri | ⊙ſet	d. m.	⊙ri | ⊙ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	2.38	1
2	5.17	2
3	7.55	3
e b n w b n	10.34	e b s w b s
1	13.12	1
2	15.49	2
3	18.27	3
e n e w n w	21.04	e s e w s w

Latitude 21 Degrees.

NorthDec.	Dec.	South Dec.
⊙ri | ⊙ſet	d. m.	⊙ri | ⊙ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	2.38	1
2	5.15	2
3	7.52	3
e b n w b n	10.30	e b s w b s
1	13.07	1
2	15.43	2
3	18.20	3
e n e w n w	20.55	e s e w s w
1	23.32	1

Latitude 22 Degrees.

NorthDec.	Dec.	SouthDec.
⊙ri | ⊙ſet	d. m.	⊙ri | ⊙ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	2.37	1
2	5.13	2
3	7.49	3
ebn wbn	10.25	e b s w b s
1	13.01	1
2	15.37	2
3	18.12	3
ene wnw	20.46	e s e w s w
1	23.21	1

Latitude 23 Degrees.

NorthDec.	Dec.	South Dec.
⊙ri | ⊙ſet	d. m.	⊙ri | ⊙ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	2.36	1
2	5.11	2
3	7.46	3
e b n w b n	10.21	e b s w b s
1	12.56	1
2	15.31	2
3	18.03	3
ene wnw	20.37	e s e w s w
1	23.11	1

Latitude 24 Degrees.

NorthDec.	Dec.	South Dec.
⊙ri | ⊙ſet	d. m.	⊙ri | ⊙ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	2.34	1
2	5.08	2
3	7.42	3
ebn wbn	10.16	ebs wbs
1	12.50	1
2	15.23	2
3	17.55	3
ene wnw	20.27	ese wsw
1	23.00	1

Latitude 25 Degrees.

NorthDec	Dec.	South Dec.
⊙ri | ⊙ſet	d. m.	⊙ri | ⊙ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	2.33	1
2	5.05	2
3	7.38	3
ebn wbn	10.11	ebs wbs
1	12.43	1
2	15.15	2
3	17.46	3
ene wnw	20.17	ese wsw
1	20.48	1

Latitude 26 Degrees.

NorthDec.	Dec.	South Dec.
⊙ri | ⊙ſet	d.m.	⊙ri | ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	2.34	1
2	5.03	2
3	7.35	3
ebn wbn	10.06	ebs wbs
1	12.36	1
2	15.08	2
3	17.37	3
en ewnw	20.06	ese wsw
1	22.36	1

Latitude 27 Degrees.

NorthDec.	Dec.	South Dec.
⊙ri | ⊙ſet	d.m.	⊙ri | ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	2.30	1
2	5.00	2
3	7.31	3
ebn wbn	10.01	eb wbs
1	12.30	1
2	15.00	2
3	17.28	3
ene wnw	19.55	ese wsw
1	22.23	1

Latitude 28 Degrees

North Dec.		Dec.	South Dec.	
☉ ri	☉ set	d. m.	☉ ri	☉ set
East	West	0.00	East	West
1		2.29	1	
2		4.58	2	
3		7.27	3	
e b n	w b n	9.55	e b s	w b s
1		12.23	1	
2		14.51	2	
3		17.18	3	
e n e	w n w	19.44	e s e	w s w
1		22.11	1	

Latitude 29 Degrees.

North Dec.		Dec	South Dec.	
☉ ri	☉ set	d. m.	☉ ri	☉ set
East	West	0.00	East	West
1		2.28	1	
2		4.55	2	
3		7.22	3	
e b n	w b n	9.50	e b s	w b s
1		12.16	1	
2		14.43	2	
3		17.08	3	
e n e	w n w	19.32	e s e	w s w
1		21.58	1	

Latitude 30 Degrees.

North Dec.		Dec.	South Dec.	
☉ ri	☉ set	d. m.	☉ ri	☉ set
East	West	0.00	East	West
1		2.27	1	
2		4.52	2	
3		7.18	3	
e b n	w b n	9.44	e b s	w b s
1		12.09	1	
2		14.34	2	
3		16.57	3	
e n e	w n w	19.20	e s e	w s w
1		21.44	1	

Latitude 31 Degrees.

North Dec.		Dec.	South Dec.	
☉ ri	☉ set	d. m.	☉ ri	☉ set
East	West	0.00	East	West
1		2.25	1	
2		4.50	2	
3		7.13	3	
e b n	w b n	9.38	e b s	w b s
1		12.01	1	
2		14.25	2	
3		16.47	3	
e n e	w n w	19.08	e s e	w s w
1		21.30	1	

Latitude 32 Degrees.

NorthDec.	Dec.	South Dec.
⊙ri ⊙ſet	d. m.	⊙ri ⊙ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	2.33	1
2	4.46	2
3	7.08	3
ebn wbn	9,31	ebs wbs
1	11.54	1
2	14.15	2
3	16.36	3
ene wnw	18.55	ese wsw
1	21.16	1

Latitude 33 Degrees.

NorthDec.	Dec.	South Dec.
⊙ri ⊙ſet	d. m.	⊙ri ⊙ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	2.22	1
2	4.43	2
3	7.04	3
ebn wbn	9.25	ebs wbs
1	11.46	1
2	14.06	2
3	16.24	3
ene wnw	18.43	ese wsw
1	21.01	1
2	23.17	2

Latitude 34 Degrees.

NorthDec.	Dec.	South Dec.
⊙ri ⊙ſet	d. m.	⊙ri ⊙ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	2.20	1
2	4.40	2
3	6.59	3
ebn wbn	9.18	ebs wbs
1	11.38	1
2	13.56	2
3	16.13	3
ene wnw	18.29	ese wsw
1	20.46	1
2	23.00	2

Latitude 35 Degrees.

NorthDec.	Dec.	South Dec.
⊙ri ⊙ſet	d. m.	⊙ri ⊙ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	2.18	1
2	4.37	2
3	6.54	3
ebn wbn	9.12	ebs wbs
1	11.29	1
2	13.46	2
3	16.02	3
ene wnw	18.16	ese wsw
1	20.30	1
2	22.43	

Latitude 36 Degrees.

North Dec.		Decl.	South Dec.	
☉ri	☉set	d. m.	☉ri	☉set
East	West	0.00	East	West
1		2.16	1	
2		4.33	2	
3		6.49	3	
e b n	w b n	9 05	e b s	w b s
1		11.20	1	
2		13.35	2	
3		15.49	3	
e n e	w n w	18 02	e s e	w s w
1		20.15	1	
2		22.25	2	

Latitude 37 Degrees.

North Dec.		Decl.	South Dec.	
☉ri	☉set	d. m.	☉ri	☉set
East	West	0.00	East	West
1		2.15	1	
2		4.30	2	
3		6.43	3	
e b n	w b n	8.58	e b s	w b s
1		11.12	1	
2		13.25	2	
3		15.36	3	
e n e	w n w	17.47	e s e	w s w
1		19.58	1	
2		22.07	2	

Latitude 38 Degrees.

North Dec.		Dec.	South Dec.	
☉ri	☉set	d. m.	☉ri	☉set
East	West	0.00	East	West
1		2.13	1	
2		4 26	2	
3		6.38	3	
e b n	w b n	8.50	e b s	w b s
1		11.03	1	
2		13.14	2	
3		15.23	3	
e n e	w n w	17.32	e s e	w s w
1		19.41	1	
2		21.49	2	

Latitude 39 Degrees.

North Dec.		Dec.	South Dec.	
☉ri	☉set	d. m.	☉ri	☉set
East	West	0.00	East	West
1		2.11	1	
2		4.22	2	
3		6.32	3	
e b n	w b n	8.43	e b s	w b s
1		10.53	1	
2		13.03	2	
3		15.10	3	
e n e	w n w	17.17	e s e	w s w
1		19.25	1	
2		21.30	2	
3		23.32	3	

Latitude 40 Degrees.

North Dec.	Dec.	South Dec.
⊙ri ⊙set	d. m.	⊙ri ⊙set
East West	0.00	East West
1	2.09	1
2	4.19	2
3	6.27	3
ebn wbn	8,36	ebs wbs
1	10.43	1
2	12.51	2
3	14.57	3
ene wnw	17.02	ese wsw
1	19.07	1
2	21.10	1
3	23.11	3

Latitude 41 Degrees.

North Dec.	Dec.	South Dec.
⊙ri ⊙set	d. m.	⊙ri ⊙set
East West	0.00	East West
1	2.07	1
2	4.15	2
3	6.22	3
ebn wbn	8.28	ebs wbs
1	10.34	1
2	12.40	2
3	14.44	3
ene wnw	16.47	ese wsw
1	18.50	1
2	20.51	2
3	22.50	3

Latitude 42 Degrees.

North Dec.	Dec.	South Dec.
⊙ri ⊙set	d. m.	⊙ri ⊙set
East West	0.00	East West
1	2.05	1
2	4.11	2
3	6.16	3
ebn wbn	8.20	ebs wbs
1	10.24	1
2	12.28	2
3	14.30	3
ene wnw	16.31	ese wsw
1	18.32	1
2	20.31	2
3	23.27	3

Latitude 43 Degrees.

North Dec.	Dec.	South Dec.
⊙ri ⊙set	d. m.	⊙ri ⊙set
East West	0.00	East West
1	2.03	1
2	4.07	2
3	6.10	3
ebn wbn	8.12	ebs wbs
1	10.14	1
2	12.16	2
3	14.16	3
ene wnw	16 15	ese wsw
1	18.14	1
2	20.10	2
3	22.05	3

Latitude 44 Degrees.

North Dec.	Decl.	South Dec.
☉ ri | ☉ ſet	d. m.	☉ ri | ☉ ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	2.01	1
2	4.03	2
3	6.04	3
e b n w b n	8.04	e b s w b s
1	10.04	1
2	12.03	2
3	14.01	3
e n e w n w	15.59	e s e w s w
1	17.54	1
2	19.50	2
3	21.42	3
nebenwbw	23.34	se be sw bw

Latitude 45 Degrees.

North Dec.	Decl.	South Dec.
☉ ri | ☉ ſet	d. m.	☉ ri | ☉ ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	2.00	1
2	3.59	2
3	5.57	3
e b n w b n	7.56	e b s w b s
1	9.54	1
2	11.51	2
3	13.46	3
e n e w n w	15.42	e s e w s w
1	17.36	1
2	19.28	2
3	21.19	3
nebenwbw	23.08	sebe swbw

Latitude 46 Degrees.

North Dec.	Dec.	South Dec.
☉ ri | ☉ ſet	d. m.	☉ ri | ☉ ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	1.58	1
2	3.55	2
3	5.51	3
e b n w b n	7.47	e b s w b s
1	9.43	1
2	11.38	2
3	13.32	3
e n e w n w	15.25	e s e w s w
1	17.17	1
2	19.07	2
3	20.55	3
nebenwbw	22.42	sebe swbw

Latitude 47 Degrees.

North Dec.	Dec.	South Dec.
☉ ri | ☉ ſet	d. m.	☉ ri | ☉ ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	1.55	1
2	3.50	2
3	5.45	3
e b n w b n	7.39	e b s w b s
1	9.33	1
2	11.25	2
3	13.17	3
e n e w n w	15.07	e s e w s w
1	16.57	1
2	18.45	2
3	20.31	3
nebenwbw	22.16	nebenwbw

Latitude 48 Degrees.

North Dec.	Dec.	South Dec.
☉ ri | ☉ ſet	d. m.	☉ ri | ☉ ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	1.53	1
2	3.46	2
3	5.38	3
e b n w b n	7.30	e b s w b s
2	9.22	1
1	11.12	2
3	13.01	3
e n e w n w	14.50	e s e w s w
1	16.38	1
2	18.24	2
3	20.07	3
nebenwbw	21.49	sebe swbw
1	23.29	1

Latitude 49 Degrees.

North Dec.	Dec.	South Dec.
☉ ri | ☉ ſet	d. m.	☉ ri | ☉ ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	1.51	1
2	3.42	2
3	5.31	3
e b n w b n	7.22	e b s w b s
1	9.10	1
2	10,59	2
3	12.46	3
e n e w n w	14.32	e s e w s w
1	16.17	1
2	18.01	2
3	19.42	3
nebenwbw	21.22	sebe swbw
1	23.01	1

Latitude 50 Degrees.

North Dec.	Dec.	South Dec.
☉ ri | ☉ ſet	d. m.	☉ ri | ☉ ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	1.48	1
2	3.37	2
3	5.25	3
e b n w b n	7.12	e b s w b s
1	8.59	1
2	10.46	2
3	12.30	3
e n e w n w	14.14	e s e w s w
1	15.57	1
2	17.39	2
3	19.18	3
nebenwbw	20.55	sebe swbw
1	22.31	1

Latitude 51 Degrees.

North Dec.	Dec.	South Dec.
☉ ri | ☉ ſet	d. m.	☉ ri | ☉ ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	1.46	1
2	3.33	2
3	5.18	3
e b n w b n	7.04	e b s w b s
1	8.48	1
2	10.32	2
3	12.14	3
e n e w n w	13.56	e s e w s w
1	15.36	1
2	17.16	2
3	18.52	3
nebenwbw	20.28	se be swbw
1	22.01	1
	23.32	2

Latitude 52 Degrees.

North Dec.		Dec.	South Dec.	
☉ ri	☉ set	d. m.	☉ ri	☉ set
East	West	0 00	East	West
1		1.44	1	
2		3.27	2	
3		5.11	3	
e b n	w b n	6.54	e b s	w b s
2		8.36	1	
1		10.18	2	
3		11.58	3	
e n e	w n w	13.37	e s e	w s w
1		15.16	1	
2		16.52	2	
3		18.27	3	
nebe	nwbw	20.00	sebe	swbw
1		21.31	1	
2		23.00		

Latitude 53 Degrees.

North Dec.		Dec.	South Dec.	
☉ ri	☉ set	d. m.	☉ ri	☉ set
East	West	0.00	East	West
1		1.42	1	
2		3.23	2	
3		5.04	3	
e b n	w b n	6.44	e b s	wbs
1		8.25	1	
2		10,04	2	
3		11.42	3	
e n e	w n w	13.19	e s e	w s w
1		14.55	1	
2		16.29	2	
3		18.01	3	
nebe	nwbw	19.32	sebe	swbw
1		21.01	1	
2		22.27	2	

Latitude 54 Degrees.

North Dec.		Dec.	South Dec.	
☉ ri	☉ set	d. m.	☉ ri	☉ set
East	West	0.00	East	West
1		1.39	1	
2		3 18	2	
3		5.57	3	
e b n	w b n	6.35	e b s	w b s
1		8.13	1	
2		9.50	2	
3		11.23	3	
e n e	w n w	13.00	e s e	w s w
1		14 33	1	
2		16.05	2	
3		17.35	3	
nebe	nwbw	19.05	sebe	swbw
1		20.30	1	
2		21.54	2	
3		23.15	3	

Latitude 55 Degrees.

North Dec.		Dec.	South Dec.	
☉ ri	☉ set	d. m.	☉ ri	☉ set
East	West	0.00	East	West
1		1.37	1	
2		3.13	2	
3		4.49	3	
e b n	w b n	6.25	e b s	w b s
1		8 01	1	
2		9.35	2	
3		11.08	3	
e n e	w n w	12.41	e s e	w s w
1		14.12	1	
2		15.42	2	
3		17.09	3	
nebe	nwbw	18.35	sebe	swbw
1		19.59	1	
2		21.21	2	
3		23.30	3	

Latitude 56 Degrees.			Latitude 57 Degrees		
NorthDec.	Dec.	South Dec.	NorthDec.	Dec.	SouthDec.
☉ ri | ☉ ſet	d. m.	☉ ri | ☉ ſet	☉ ri | ☉ ſet	d. m.	☉ ri | ☉ ſet
Eaſt Weſt	0.00	Eaſt Weſt	Eaſt Weſt	0.00	Eaſt Weſt
1	1.34	1	1	1.32	1
2	3.09	2	2	3.04	2
3	4.42	3	3	4.35	3
eb n wbn	6.16	e b s w b s	eb n wbn	6.06	e b s w b s
1	7.49	1	1	7.36	1
2	9.21	2	2	9 06	2
3	10.51	3	3	10.34	3
ene wnw	12.22	ese wsw	ene wnw	12.01	ese wsw
1	13.50	1	1	13.28	1
2	15.18	2	2	14.53	2
3	16.42	3	3	16.16	3
benwbw	18.06	sebe swbw	nebenwbw	17.37	sebe swbw
1	19.28	1	1	18.56	1
2	20.47	2	2	20.13	2
3	22.03	3	3	21.27	3
ne nw	23.18	se sw	ne nw	22.39	se sw

Latitude 58 Degrees.			Latitude 59 Degrees.		
Eaſt Weſt	0.00	Eaſt Weſt	Eaſt Weſt	0 00	Eaſt Weſt
1	1.30	1	1	1.27	1
2	2.59	2	2	2.54	2
3	4.28	3	3	4.20	3
e b n wbn	5.56	e b s w b s	e bn wbn	5.46	e b s w b s
1	7.24	1	1	7.11	1
2	8.51	2	2	8,36	2
3	10.17	3	3	10.00	3
ene wnw	11.42	ese wsw	ene wnw	11.22	ese wsw
1	13.06	1	1	12.44	1
2	14.28	2	2	14.03	2
3	15.48	3	3	15.21	3
nebenwbw	17.07	sebe swbw	nebenwbw	16,37	sebeswbw
1	18.24	1	1	17,52	1
2	19.39	2	2	19.04	2
3	20.51	3	3	20.14	3
n e n w	22.00	se sw	n e nw	21,22	se sw
1	23,08	1	1	22,26	1
			2	23,27	2

Latitude 60 Degrees.

North Declination.			South Declination.		
⊙ rise	D. M	⊙ set	⊙ rise	D. M.	⊙ set
East	0.00	West	East	0.00	West
1	1.25	1	1	1.25	1
2	2.49	2	2	2.49	2
3	4.12	3	3	4.12	3
e by n	5.36	w by n	e by s	5.36	w by s
1	6 59	1	1	6.59	1
2	8.21	2	2	8.21	2
3	9.42	3	3	9.42	3
e n e	11.02	w n w	e s e	11.02	w s w
1	12.21	1	1	12.21	1
2	13.38	2	2	13.38	2
3	14.53	3	3	14.53	3
n e by e	16.08	nw by w	s e by e	16.08	s w by s
1	17.20	1	1	17.20	1
2	18.30	2	2	18.30	2
3	19.38	3	3	19.38	3
n e	20.42	n w	s e	20.42	s w
1	21.45	1	1	21.45	1
2	22.45	2	2	22.44	2

The Description and Use of the foregoing TABLES.

1. THESE Tables of the Points of the Compass, (for the Sun, or any Star whose Declination exceeds not 23 deg. 29m.) begin at Latitude 0 deg. and proceed orderly to 60 deg. (being some four, some two Tables, in one Page) and sixty-one in all.

2. In each Table are five Columns; the middlemost contains the Degrees of Declination, either North or South; those two on each Side of it, marked ⊙ rise ⊙ set (under North or South Declination) stand for Sun-rising and Sun-setting.

3. The

3. The firſt and ſecond Columns (under *North Declination)* as alſo the fourth and fifth Columns (under *South Declination)* contain the Points, and each Quarter of a Point of the Compaſs, of both Riſing and Setting: Thus, *Eaſt*, *Weſt*, under which is 1, 2, 3; that is *Eaſt* or *Weſt* 1 Quarter, 2 Quarters, 3 Quarters, *Northerly* or *Southerly*; then E. by N. W. by N. under which is 1, 2, 3; that is E. by N. or W. by N. 1 Quarter, 2 Quarters *Northerly*, *&c.*

Theſe Tables are ready Helps for finding the Variation of the Compaſs with Eaſe, and ſufficient Exactneſs, as is evident from the following Explanation.

To find the Point of the Compaſs that the Sun riſeth or ſetteth with, at any Time of the Year.

FIRST, ſeek the Sun's Declination in the Table of Declination for the Time propoſed; with which enter the foregoing Table, finding the Latitude in the Head of the Table, and the Declination in the third Column; againſt which, on the Left-hand, if it be North Declination, but on the Right-hand if it be South Declination, is the Point of the Compaſs that the Sun riſes or ſets at, according to the Titles at the Head of the Table.

Note, Theſe Tables ſhew the true Points of the Sun's Riſing and Setting; ſo that you may readily know at any Time, ſeeing the Sun riſe or ſet, the Variation by an ordinary Meridian Compaſs.

There are ſome Compaſſes not touched ſo well as they ought to be; others in Time will grow weak, or loſe their magnetic Virtue.

Now by theſe foregoing Tables you may very readily diſcover any of theſe Defects.

It may indeed be objected, they cannot ſee the Sun by an ordinary Meridian Compaſs, ſo near as is required

To this I anſwer, it's as eaſy to ſet the Sun by the Compaſs, as to ſteer a Ship by it; for expert Seamen can ſet the Sun, or Headland, to near a Quarter of a Point by their Hand, (but with Sights much nearer the Truth.) The Poſture to obſerve in ſuch Caſe, I adviſe, is thus:

Set the Compaſs about two Feet high, and directing your Hand towards the Sun, note what Point, Half Point, or Quarter Point, the Sun riſeth or ſetteth on; then in that Table belonging to the Latitude, ſee whether the Sun riſeth or ſets that Day upon the ſame Point, found by Obſervation; if they agree, there is no Variation; but if they do not agree, the Compaſs is not true, or there is Variation; and the Variation is ſo much, as is the Difference between the Obſervation and the Table.

Example 1. Admit in Latitude 30 Degrees North, the Sun having 9 Degrees 44 Minutes North Declination; I obſerve the Sun that Day to riſe upon the E.N.E. Point of the Compaſs. I demand the Variation.

In the Head of the foregoing Tables, look for the Latitude 30 Degrees; and in the third Column for 9 deg. 44 min. North Declination; and againſt it (under ☉ riſe) is E. by N. which ſheweth that there is one Point Variation. For it appears by the Table, that the E. N. E. Point on the Compaſs is the true E. by N. Point; and the E. by N. (as it is upon the Compaſs) is the true E. Point; the Eaſt Point is the true E. by S. the S.E. is the S.E. by S. and the South is the S. by W. the W. is the W. by N. and

This plainly appears by the *Rectifier*, if you bring the E. by N. on the outward Circle, right againſt the E.N.E. on the inward Circle.

Now ſuppoſe we were to obſerve the Sun at his ſetting, in the Latitude of 30 deg. with Declination 9 deg. 44 min. North as aboveſaid, we ſhould find the Sun to ſet exactly at Weſt by the Compaſs, although in the Morning

Morning we did find the Sun to riſe at E. N. E. I know this will appear a Contradiction to ſome; but if you caſt your Eye upon the *Rectifier*, you may ſee it's a certain Truth.

Example 2. In Latitude 37 deg. North, the Sun's Declination 8 deg. 58 min. North, I obſerve the Sun to riſe E. by N. by the Compaſs; I demand the Variation

In the Table that belongs to 37 deg. againſt 8 deg. 58 min. North Declination, and under ☉ riſe is E. by N. which ſheweth there is no Variation, becauſe the Obſervation agrees with the Tables.

Note, If the Declination for the Day propoſed be not the ſame with the Declination in the Tables, then have Regard to the neareſt, allowing for the Difference, by the Rule of Proportion.

Example 3. In the Latitude 37 deg. North, ſuppoſe the Sun's Declination 10 deg. 15 min. North, I demand the Point of the Compaſs the Sun then riſeth upon?

In the Tables neareſt to 10 deg. 15 min. is 11 deg. 12 min. againſt which the Sun riſeth E. by N. a Quarter N. and ſets W. by N. a Quarter N. but in the Tables for 37 deg Latitude, the Declination propoſed is near about the middle, between 8 deg. 58 min. and 11 deg. 12 min. Therefore the Sun riſeth E. by N. half a Quarter N. and ſetteth W. by N. half a Quarter N.

Underſtand the like in any Caſe, let the Declination be what it will, and in any other Latitude.

Example 4. Admit in Latitude 38 deg. 20m. North, and Declination 19d. 50m. South: The Sun riſeth upon the ESE. Point of the Compaſs; I demand the Variation?

In the Table for Latitude 38 deg. and againſt 19 deg. 41 min. (the neareſt to the given Declination) is E S.E. a Quarter S. which ſheweth that there is a Quarter of a Point Variation. For the E.S.E. Point is E.S E. a quarter S. and the North Point is N. a quarter E. For, if you bring ESE. aquarter S.on the outward Circle of the *Rectifier* right againſt E.S.E. on the inward Circle, then S.S.W. on the Compaſs

Compafs is SSW. a quarter W. and SE. is SE. a quarter S. and E. is E. a quarter S. And fo for any other Point, Half point, or Quarter point, by cafting your Eye upon the *Rectifier.*

Note, Thefe Tables fhew the true Points of Rifing and Setting, and the outward Circle on the *Rectifier* doth the fame; but the Compafs, when it differeth from the Tables, fhews a falfe Point; and the inward Circle on the *Rectifier* doth the fame.

Example 5. Admit in Latitude 47d. 24m. North, the Declination 15d. 2m. South, the Sun's rifing E. by S. by the Compafs; I demand the Variation.

By the Tables the Sun fhould rife ESE. therefore there is one Point Variation: For if you bring ESE. on the outward Circle of the *Rectifier,* over againft the E. by S. on the inward Circle, then the N. by W. on the Compafs is the true North point; the NW. is the NW. by N. and the S. by E. is the true South Point.

By this Time I fuppofe the Reader able to difcover how much the Variation is, and how to reckon it without any Geometric Demonftration, or Arithmetic Calculation.

Note, If you have any odd minutes of Latitude, go to that Table neareft the Latitude you are in.

I come now to refolve a Queftion which fome are puzzled with; and that is this:

Queft. If the Sun rife at ENE. by any Compafs in any Latitude, fhould not he fet the fame Day at WNW. by the fame Compafs, and in the fame Latitude?

Anfwer. If there be no Variation he will; but if there be Variation, he will not. The Reafon is evident by the *Rectifier.*

By thefe Tables you may know upon what Point of the Compafs any of the Stars rife and fet in any Latitude the Tables contain, either North or South, if the Declination doth not exceed the Sun's greateft Declination.

Example 6. Let it be required to find the Points of the Compafs the *Bull's Eye* rifes and fets with, in the Latitude of 50 Degrees North.

The

The Declination of this Star is 16 Deg. North; in the Table that belongs to 50d. againſt 16 Deg. North Declination, the true Point of Riſing is E.N.E. a Quarter N. and the true Point of Setting W.N.W. a Quarter N.

Underſtand the like for any other Star, whoſe Declination doth not exceed the Sun's greateſt Declination.

The Uſe of the RECTIFIER.

THIS Inſtrument, as before deſcribed, (in Page 93, 94, and 95) containeth two Circles, or Compaſſes, one within the other; but as it is made of Wood, the one moves upon the other, and by it the Compaſs, when it varies, may be rectified as follows:

Bring the true Point of Riſing or Setting (as the Table ſheweth) on the outward or under Compaſs, right againſt the falſe Point of Riſing or Setting (as your Compaſs ſheweth) on the inward or upper Compaſs; then will the under Compaſs rectify the upper.

Example 7. Admit in Latitude 45d. N. the Sun's Declination being 7d. 56m. South, the Sun ſetting upon the W. by N. Point of the Compaſs, I demand the Variation?

The Sun, if there be no Variation, will ſet at W. by S. and riſe at E. by S. as appears from the Table; therefore it is plain that there are two Points Variation.

Bring the W. by S. Point on the outward Compaſs, right againſt the W. by N. Point on the inward Compaſs; then the Points upon the outward Compaſs explain the Points that are upon the inward; ſo that according to the foregoing Obſervation, the N.N.E. Point on the Compaſs is the true North: The North is the true N.N.W. the W. by N. is the true W. by S. the S.E. by E. is the true E. by S. And ſo for any other Point of the Compaſs by only looking on the *Rectifier.*

And thus you may rectify the Compaſs, without reckoning which Way the Variation is, either Eaſtward or Weſtward: The *Rectifier* doing it ſo plain, that you can't be miſtaken.

A TABLE of Amplitudes, fitting all Places from the Equator, to 60 Degrees of Latitude either North or South.

The Degrees of Latitude.

Sun's Decli. (Degrees of Declination.)	1 D	1 M	2 D	2 M	3 D	3 M	4 D	4 M	5 D	5 M	6 D	6 M
0	00	00	00	00	00	00	00	00	00	00	00	00
1	01	00	01	00	01	00	01	00	01	00	01	00
2	02	00	02	00	02	00	02	00	02	00	02	00
3	03	00	03	00	03	00	03	00	03	00	03	01
4	04	00	04	00	04	00	04	00	04	01	04	01
5	05	00	05	00	05	00	05	00	05	01	05	01
6	06	00	06	00	06	00	06	01	06	01	06	02
7	07	00	07	00	07	00	07	01	07	01	07	02
8	08	00	08	00	08	01	08	01	08	02	08	02
9	09	00	09	00	09	01	09	01	09	02	09	02
10	10	00	10	00	10	01	10	01	10	02	10	03
11	11	00	11	00	11	01	11	01	11	02	11	03
12	12	00	12	00	12	01	12	01	12	03	12	04
13	13	00	13	00	13	01	13	01	13	03	13	04
14	14	00	14	00	14	01	14	02	14	03	14	04
15	15	00	15	00	15	01	15	02	15	03	15	05
16	16	00	16	01	16	01	16	02	16	04	16	05
17	17	00	17	01	17	01	17	02	17	04	17	05
18	18	00	18	01	18	01	18	02	18	04	18	06
19	19	00	19	01	19	01	19	02	19	04	19	06
20	20	00	20	01	20	02	20	03	20	05	20	06
21	21	00	21	01	21	02	21	03	21	05	21	07
22	22	00	22	01	22	02	22	03	22	05	22	07
23	23	00	23	01	23	02	23	03	23	05	23	07
23.29	23	22	23	30	23	31	23	33	23	35	23	39

A TABLE of Amplitudes, fitting all Places from the Equator, to 60 Degrees of Latitude either North or South.

The Degrees of Latitude.

Sun's Decli	7		8		9		10		11		12	
	D	M	D	M	D	M	D	M	D	M	D	M
0	00	00	00	00	00	00	00	00	00	00	00	00
1	01	00	01	00	01	00	01	01	01	01	01	01
2	02	01	02	01	02	01	02	02	02	02	02	03
3	03	01	03	01	03	01	03	03	03	03	03	04
4	04	02	04	02	04	02	04	04	04	04	04	05
5	05	02	05	02	05	03	05	05	05	05	05	07
6	06	02	06	03	06	04	06	06	06	06	06	08
7	07	03	07	04	07	05	07	07	07	08	07	09
8	08	03	08	04	08	06	08	08	08	09	08	11
9	09	04	09	05	09	06	09	09	09	10	09	12
10	10	04	10	06	10	07	10	10	10	11	10	13
11	11	05	11	06	11	08	11	11	11	13	11	15
12	12	05	12	07	12	09	12	12	12	14	12	16
13	13	06	13	08	13	09	13	13	13	15	13	17
14	14	06	14	08	14	10	14	14	14	16	14	19
15	15	07	15	09	15	11	15	15	15	17	15	20
16	16	07	16	10	16	12	16	16	16	19	16	22
17	17	08	17	10	17	13	17	17	17	20	17	23
18	18	08	18	11	18	14	18	18	18	21	18	25
19	19	09	19	12	19	15	19	19	19	22	19	26
20	20	09	20	12	20	16	20	20	20	24	20	28
21	21	10	21	13	21	17	21	21	21	25	21	29
22	22	10	22	13	22	18	22	22	22	27	22	31
23	23	11	23	14	23	19	23	23	23	28	23	33
23.29	23	40	23	15	23	50	23	54	23	59	24	05

Degrees of Declination.

A TABLE of Amplitudes, fitting all Places from the Equator, to 60 Degrees of Latitude either North or South.

The Degrees of Latitude.

Sun's Decli	13		14		15		16		17		18	
	D	M	D	M	D	M	D	M	D	M	D	M
0	00	00	00	00	00	00	00	00	00	00	00	00
1	01	02	01	20	01	02	01	02	01	02	01	03
2	02	03	02	22	02	04	02	05	02	05	02	06
3	03	05	03	24	03	06	03	07	03	08	03	09
4	04	06	04	26	04	08	04	10	04	11	04	12
5	05	08	05	09	05	10	05	12	05	13	05	15
6	06	10	06	11	06	13	06	15	06	17	06	19
7	07	11	07	13	07	15	07	17	07	19	07	22
8	08	13	08	15	08	17	08	19	08	22	08	25
9	09	14	09	17	09	19	09	21	09	25	09	28
10	10	16	10	19	10	21	10	24	10	28	10	31
11	11	17	11	20	11	23	11	27	11	30	11	34
12	12	19	12	22	12	25	12	29	12	33	12	38
13	13	20	13	24	13	27	13	32	13	36	13	41
14	14	22	14	26	14	30	14	34	14	39	14	44
15	15	24	15	28	15	32	15	37	15	42	15	47
16	16	26	16	30	16	35	16	40	16	45	16	51
17	17	28	17	32	17	37	17	42	17	48	17	54
18	18	30	18	34	18	39	18	45	18	51	18	58
19	19	31	19	36	19	42	19	48	19	54	20	01
20	20	33	20	38	20	44	20	51	20	57	21	04
21	21	35	21	40	21	46	21	53	21	00	22	08
22	22	37	22	43	22	49	22	56	22	04	23	12
23	23	39	23	45	23	51	23	58	24	06	24	15
-23.29	24	11	24	16	24	24	24	32	24	40	24	49

Degrees of Declination.

A TABLE of Amplitudes, fitting all Places from the Equator, to 60 Degrees of Latitude either North or South.

The Degrees of Latitude.

Sun's Decli. (Degrees of Declination.)	19		20		21		22		23		24	
	D	M	D	M	D	M	D	M	D	M	D	M
0	00	00	00	00	00	00	00	00	00	00	00	00
1	01	03	01	04	01	04	01	05	01	05	01	06
2	02	07	02	08	02	08	02	09	02	10	02	12
3	03	10	03	12	03	13	03	14	03	15	03	37
4	04	14	04	16	04	17	04	19	04	21	04	23
5	05	17	05	19	05	22	05	23	05	26	05	28
6	06	21	06	23	06	26	06	28	06	31	06	34
7	07	24	07	27	07	30	07	33	07	37	07	40
8	08	28	08	31	08	34	08	38	08	42	08	46
9	09	31	09	35	09	39	09	43	09	47	09	51
10	10	35	10	39	10	43	10	48	10	52	10	57
11	11	38	11	43	11	48	11	53	11	58	12	03
12	12	42	12	47	12	52	12	58	13	03	13	09
13	13	46	13	51	13	57	14	03	14	09	14	15
14	14	50	14	55	15	01	15	08	15	14	15	21
15	15	53	16	00	16	06	16	13	16	20	16	27
16	16	57	17	04	17	11	17	18	17	26	17	34
17	18	01	18	08	18	15	18	23	18	31	18	40
18	19	05	19	12	19	20	19	28	19	37	19	46
19	20	08	20	16	20	24	20	33	20	42	20	52
20	21	12	21	20	21	29	21	39	21	49	21	59
21	22	16	22	25	22	34	22	44	22	55	23	07
22	23	20	23	29	23	39	23	50	24	01	24	12
23	24	24	24	54	24	44	24	55	25	07	25	19
23.29	24	58	25	08	25	18	25	29	25	41	25	54

A TABLE of Amplitudes, fitting all Places from the Equator, to 60 Degrees of Latitude either North or South.

The Degrees of Latitude.

Sun's Decli.	25		26		27		28		29		30	
Degrees of Declination.	D	M	D	M	D	M	D	M	D	M	D	M
0	00	00	00	00	00	00	00	00	00	00	00	00
1	01	06	01	07	01	08	01	08	01	09	01	09
2	02	12	02	13	02	15	02	16	02	17	02	18
3	03	18	03	20	03	22	03	24	03	26	03	28
4	04	25	04	27	04	29	04	32	04	34	04	37
5	05	31	05	33	05	37	05	40	05	43	05	46
6	06	37	06	41	06	44	06	48	06	52	06	56
7	07	43	07	48	07	51	07	56	08	01	08	06
8	08	50	08	54	08	59	09	04	09	09	09	15
9	09	56	10	01	10	06	10	12	10	18	10	24
10	11	03	11	08	11	14	11	21	11	27	11	34
11	12	09	12	15	12	21	12	28	12	36	12	44
12	13	16	13	23	13	30	13	37	13	45	13	53
13	14	22	14	30	14	37	14	45	14	54	15	03
14	15	29	15	37	15	45	15	54	16	0	16	12
15	16	35	16	44	16	53	17	03	17	12	17	23
16	17	42	17	51	18	01	18	11	18	21	18	32
17	18	49	18	59	19	09	19	20	19	31	19	43
18	19	56	20	06	20	17	20	29	20	41	20	54
19	21	02	21	13	21	25	21	38	21	1	22	05
20	22	10	22	22	22	34	22	48	23	02	23	16
21	23	18	23	30	23	43	23	57	24	12	24	27
22	24	24	24	37	24	51	25	06	25	22	25	38
23	25	32	25	46	26	01	26	16	26	32	26	49
23 29	26	08	26	23	26	37	26	52	27	08	27	25

A TABLE of Amplitudes, fitting all Places from the Equator, to 60 Degrees of Latitude either North or South.

The Degrees of Latitude.

Sun's Decli. (Degrees of Declination.)	31		32		33		34		35		36	
	D	M	D	M	D	M	D	M	D	M	D	M
0	00	00	00	00	00	00	00	00	00	00	00	00
1	01	10	01	10	01	11	01	12	01	13	01	14
2	02	19	02	21	02	23	02	25	02	27	02	29
3	03	30	03	33	03	35	03	38	03	40	03	43
4	04	40	04	43	04	46	04	50	04	53	04	57
5	05	50	05	54	05	57	06	02	06	06	06	11
6	07	00	07	05	07	09	07	15	07	20	07	25
7	08	11	08	16	08	21	08	27	08	33	08	40
8	09	21	09	27	09	33	09	39	09	46	09	54
9	10	31	10	38	10	45	10	52	11	10	11	08
10	11	41	11	48	11	55	12	03	12	12	12	21
11	12	52	13	00	13	09	13	18	13	28	13	39
12	14	02	14	11	14	21	14	32	14	43	14	54
13	15	13	15	23	15	33	15	44	15	56	16	09
14	16	22	16	33	16	45	16	57	17	10	17	24
15	17	34	17	46	17	58	18	11	18	25	18	40
16	18	44	18	57	19	11	19	25	19	40	19	55
17	19	56	20	10	20	24	20	39	20	55	21	11
18	21	07	21	21	21	36	21	53	22	10	22	27
19	22	19	22	34	22	50	23	07	23	25	23	44
20	23	31	23	47	24	04	24	22	24	41	25	00
21	24	43	25	00	25	18	25	37	25	56	26	17
22	25	55	26	13	26	32	26	52	27	13	27	35
23	27	07	27	26	27	46	28	07	28	29	28	52
23 29	27	43	28	03	28	23	28	45	29	05	29	32

A TABLE of Amplitudes, fitting all Places from the Equator, to 60 Degrees of Latitude either North or South.

The Degrees of Latitude.

Sun's Decli.	37		38		39		40		41		42	
Degrees of Declination.	D	M	D	M	D	M	D	M	D	M	D	M
0	00	00	00	00	00	00	00	00	00	00	00	00
1	01	15	01	16	01	17	01	18	01	20	01	21
2	02	30	02	32	02	34	02	36	02	39	02	41
3	03	45	03	48	03	51	03	54	03	58	04	02
4	05	00	05	04	05	08	05	13	05	18	05	23
5	06	16	06	21	06	26	06	32	06	38	06	44
6	07	31	07	37	07	43	07	50	07	57	08	05
7	08	47	08	54	09	01	09	09	09	17	09	26
8	10	02	10	10	10	19	10	28	10	37	10	47
9	11	17	11	27	11	37	11	47	11	58	12	09
10	12	32	12	43	12	54	13	06	13	18	13	31
11	13	50	14	01	14	13	14	26	14	39	14	53
12	15	06	15	18	15	31	15	45	16	00	16	15
13	16	22	16	35	16	49	17	04	17	20	17	37
14	17	38	17	52	18	08	18	24	18	42	19	00
15	18	55	19	11	19	28	19	45	20	04	20	23
16	20	11	20	28	20	46	21	05	21	25	21	46
17	21	28	21	46	22	06	22	26	22	48	23	10
18	22	48	23	05	23	25	23	47	24	10	24	34
19	24	04	24	20	24	46	25	09	25	33	25	58
20	25	21	25	43	26	06	26	30	26	56	27	24
21	26	39	27	02	27	27	27	53	28	21	28	50
22	27	58	28	23	28	49	29	16	29	45	30	16
23	29	17	29	43	30	11	30	40	31	11	31	43
23.29	29	58	30	24	30	52	31	22	31	54	32	28

A TABLE of Amplitudes, fitting all Places from the Equator, to 60 Degrees of Latitude either North or South.

The Degrees of Latitude.

Sun's Decli	43		44		45		46		47		48	
Degrees of Declination.	D	M	D	M	D	M	D	M	D	M	D	M
0	00	00	00	00	00	00	00	00	00	00	00	00
1	01	22	01	23	01	25	01	26	01	28	01	29
2	02	44	02	47	02	50	02	53	02	56	02	59
3	04	06	04	10	04	15	04	19	04	24	04	29
4	05	28	05	34	05	40	05	46	05	52	05	59
5	06	51	06	58	07	05	07	12	07	20	07	29
6	08	13	08	21	08	30	08	39	08	49	08	59
7	09	35	09	45	09	56	10	06	10	18	10	30
8	10	58	11	09	11	21	11	34	11	47	12	00
9	12	21	12	34	12	47	13	01	13	16	13	31
10	13	44	13	58	14	13	14	28	14	14	15	02
11	15	07	15	22	15	38	15	56	16	15	16	34
12	16	31	16	48	17	06	17	25	17	45	18	06
13	17	55	18	13	18	33	18	54	19	16	19	39
14	19	18	19	39	20	00	20	23	20	47	21	12
15	20	43	21	05	21	28	21	51	22	18	22	45
16	22	08	22	32	22	56	23	23	23	50	24	20
17	23	34	23	59	24	25	24	53	25	23	25	55
18	24	59	25	26	25	54	26	25	26	57	27	31
19	26	25	26	54	27	25	27	58	28	22	29	07
20	27	53	28	23	28	56	29	31	30	07	30	45
21	29	00	29	23	30	27	31	03	31	42	32	23
22	30	48	31	22	31	58	32	37	33	18	34	03
23	32	16	32	51	33	30	34	12	34	56	35	43
23.29	33	03	33	40	34	20	35	03	35	48	36	35

A TABLE of Amplitudes, fitting all Places from the Equator, to 60 Degrees of Latitude either North or South.

The Degrees of Latitude.

Sun's Decli. (Degrees of Declination.)	49		50		51		52		53		54	
	D	M	D	M	D	M	D	M	D	M	D	M
0	00	00	00	00	00	00	00	00	00	00	00	00
1	01	31	01	33	01	35	01	37	01	39	01	42
2	03	03	03	06	03	10	03	15	03	20	03	24
3	04	34	04	40	04	46	04	52	04	59	05	06
4	06	06	06	14	06	22	06	30	06	39	06	49
5	07	38	07	48	07	58	08	08	08	19	08	31
6	09	10	09	21	09	33	09	46	10	00	10	15
7	10	42	10	55	11	09	11	24	11	40	11	57
8	12	14	12	29	12	45	13	02	13	21	13	41
9	13	47	14	05	14	24	14	43	14	04	15	26
10	15	21	15	40	16	01	16	23	16	46	17	11
11	16	54	17	16	17	39	18	03	18	29	18	57
12	18	28	18	52	19	18	19	44	20	12	20	43
13	20	03	20	29	20	57	21	26	21	57	22	30
14	21	38	22	06	22	37	23	08	23	42	24	18
15	23	14	23	45	24	18	24	52	25	28	26	07
16	24	51	25	24	25	59	26	36	27	16	27	58
17	26	28	27	03	27	41	28	21	29	04	29	50
18	28	06	28	43	29	24	30	07	30	53	31	42
19	29	45	30	25	31	08	31	55	32	45	33	38
20	31	25	32	08	32	54	33	44	34	39	35	35
21	33	06	33	52	34	41	35	34	36	31	37	32
22	34	48	35	37	36	30	37	27	38	29	39	26
23	36	33	37	26	38	23	39	24	40	29	41	40
23.29	37	26	38	20	39	19	40	23	41	29	42	46

A TABLE of Amplitudes, fitting all Places from the Equator, to 60 Degrees of Latitude either North or South.

The Degrees of Latitude.

Sun's Decli	55 D	55 M	50 D	50 M	57 D	57 M	58 D	58 M	59 D	59 M	60 D	60 M
0	00	00	00	00	00	00	00	00	00	00	00	00
1	01	45	01	47	01	50	01	53	01	56	02	00
2	03	29	03	34	03	40	03	46	03	53	04	00
3	05	14	05	22	05	31	05	40	05	50	06	00
4	06	59	07	10	07	22	07	34	07	47	08	01
5	08	44	08	57	09	11	09	26	09	43	10	02
6	10	30	10	47	11	04	11	22	11	42	12	04
7	12	15	12	35	12	56	13	18	13	41	14	06
8	14	02	14	25	14	48	15	14	15	41	16	10
9	15	49	16	14	16	45	17	10	17	41	18	14
10	17	37	18	05	18	33	19	07	19	41	20	18
11	19	26	19	56	20	29	21	04	21	43	22	26
12	21	15	21	49	22	25	23	04	23	47	24	34
13	23	05	23	43	24	23	25	07	25	54	26	44
14	24	56	25	37	26	21	27	09	28	01	28	55
15	26	49	27	34	28	22	29	14	30	12	31	09
16	28	43	29	32	30	24	31	21	32	22	33	27
17	30	39	31	31	32	27	33	28	34	32	35	47
18	32	35	33	33	34	34	35	40	36	53	38	05
19	34	35	35	36	36	46	37	54	39	13	40	36
20	36	36	37	42	38	53	40	12	41	37	43	10
21	38	39	39	51	41	09	42	34	44	07	45	48
22	40	47	42	04	43	27	44	59	46	40	48	32
23	42	56	44	19	45	50	47	30	49	21	51	23
23.29	44	00	45	27	47	02	48	46	50	47	52	51

Degrees of Declination.

The Use of the Tables of Amplitudes.

THE Sun or Star's Amplitude is the Diſtance of the Riſing or Setting of the Sun or Star from the Eaſt or Weſt Point of the Horizon, in Degrees and Minutes, reckoned in the Horizon ; either Northerly or Southerly.

Note, When the Sun or Star's have North Declination, they riſe to the Northward of the Eaſt and ſet to the Northward of the Weſt : But if their Declination be South, they riſe to the Southward of the Eaſt, and ſet to the Southward of the Weſt : And by theſe Tables the Amplitude is thus found, *viz.*

Look the Latitude in the Head of the Tables, the Declination in the firſt Column on the Left-Hand ; and in the common Angle of Meeting is the Amplitude required.

Example 1. In the Latitude of 30 deg. the Sun's Declination being 7d. 0m. North, I demand the Amplitude ?

Anſw. The Amplitude is 8 deg. 6 min. For under Latitude 30d. in Page 140, and againſt Declination 7d. you will find 8d. 6m. which is the Amplitude from the Eaſt Northward at Sun-riſing, and from the Weſt Northward at Sun-ſetting, But if the Declination had been 7d. 0m. South in Latitude 30d. as aforeſaid, then the Amplitude would have been 8d. 6m. from the Eaſt Southward at Sun-riſing, and 8d. 6m. from the Weſt-Southward at Sun-ſetting.

If there be any odd Minutes of Declination, take the Proportional Parts.

Example 2. In the Latitude of 42d. 30m. the Sun's Declination being 12d. 15m. I demand the Amplitude ?

Anſw. The Ampl. is 16d. 43m. found as follows : According to the former Directions, for the Lat. of 42d.

and Declin. being { 12 / 13 } d. the Ampl. is { 16d. 15m. / 17d. 37m. }

Subſtract, and their Difference is———————— 1d. 22m.

Then

Then ſay, as 1d. or 60m. is to 1d. 22m. or 82m. ſo is 15m. to 20m. found as hereunder:

If 60m. give———82m. what ſhall 15m.?

15

———

410
82

———

6|0)123|0(20m. Proportional Parts.
030 Remainder.

———

Lat. 42d. and Declin. 12d. the Amplit. is	16d.	: 15m.
To it add the Proportional Parts above ——	00d.	: 20m.
Gives Amplitude for Declin. 12d 15m. to be	16d.	: 35m.
Again, for Lat. 43d. and Declin. ——— { 12 / 13 } deg. Ampl. ——is—— {	16d. / 17d.	: 31m. / : 55m.
Subſtracted makes the Difference to be ———	1d.	: 24m.

Then ſay, As 60m. is to 1d. 24m. or 84m. ſo is 15m. to 21m. found as hereunder:

If 60m. give ——— 84m. what ſhall 15m.

15

———

420
84

———

6|0)126|0(21min. Proportional Parts.
06

———

00 Remainder.

	D.	M.
Lat. 43d. and Declin. 12d. Amplitude is ———	16	: 31
To it add the Proportional Parts above———	00	: 21
Gives for Declination 12d. 15m. the Amplitude is	16	: 52

Now becauſe the given Latitude 42d. 30m. is in the middle between 42d. and 43d. therefore the Medium of the Amplitude before found, is the Amplitude required. and is thus:

Lat. $\left\{ \begin{matrix} 42 \\ 43 \end{matrix} \right\}$d. Decl. 12d. 15m. the Ampl. is $\left\{ \begin{matrix} 16d. : 35m. \\ 16d. : 52m. \end{matrix} \right.$

Added together, is———————————— 33d. : 27m.

The half is the Amplitude required——— 16d. : 43m. Thus may the Amplitude be found for any odd Minutes of Latitude or Declination, though the Table is calculated for whole Degrees only.

By this Table the Variation of the Compass is most readily found; for by the Azimuth or Amplitude Compass find the Sun or Star's Magnetic Amplitude, at their Rising or Setting; and their true Amplitude (according to the Latitude of the Place, and their Declination) by this Table; the Difference of these Amplitudes (when both are North or both South,) but their Sum (if one be North the other South) is the Variation of the Compass.

But by the *Rectifier* it is most easily done thus:

Bring the Magnetic Amplitude (on the upper or innermost Compass) right against the true Amplitude (on the lower or outermost Compass) then doth the North Point in the upper stand against the Variation in the lower; and the upper Compass is explained in all its Parts by the lower Compass.

Example 1. Suppose the Magnetic Amplitude at Sunrising (found by the Azimuth or Amplitude Compass) be East Southerly (15d. 30m. and the true Amplitude (according to the Latitude of the Place, and the Declination of the Object observed) be East Southerly 26d. 45m. I demand the Variation of the Compass?

By the *Rectifier.*

Bring 15d. 30m. East Southerly on the upper Compass, against 26d. 45m. East Southerly on the lower Compass. Then doth the North Point on the first stand right against 11d. 15m. North Easterly on the latter; so that the Compass doth vary 11d. 15m. or one Point East.

Example

Ex. 2.	True	Ampl.	07d. 00m. East Northerly.
	Magn.		15d. 30m. East Southerly.

I demand the Variation of the Compass?

By the Rectifier.

Bring 15d. 30m. East Southerly on the upper Compass, right against 7 deg. East Northerly on the lower Compass, then the North Point on the first stands against 22 deg. 30 min. on the last, North Westerly, that is two Points West Variation. In like Manner for any other; and thus the Variation is most readily found. This *RECTIFIER* is made of Wood

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The APPENDIX contains the Description of such INSTRUMENTS as are most useful in *Navigation.*

The Description and Use of the Fore-staff, *or* Cross-staff.

THE *Fore-staff*, so called from the Posture of the Observer in using it, whose Face is towards the Object observed; though for the Sun it is so contrived (for preserving the Eye) to be used backward. It is called also a *Cross-Staff* from its Form; being a Square Staff with three or four Pieces of Wood across it, which are called Crosses, or Vanes.

The Staff is uſually about 30 Inches, or 3 Feet long, and more than half an Inch Square, having four Sides, each graduated unequally like a Scale of Tangents. To each of them belongs a diſtinct Croſs; though ſometimes the ſhorteſt Croſs is made to ſerve two Sides of the Staff; that is, the Breadth is for the Tenth-Croſs, and the Length for the Thirty-Croſs. Beſides this, it hath two Croſſes more; the longeſt is the Ninety-Croſs, and the other is the Sixty-Croſs. The four Croſſes are thus to be underſtood, *viz.*

10	Croſs belongs to that Side beginning at	4	and ending at	10
30		10		30
60		20		60
90		30		90

The Figure of the *Fore-Staff.*



The Use of the Fore-Staff.

BEFORE the Invention of *Hadley's Quadrant* it was common and ordinary at Sea, to take the Meridian Altitude of the Sun or Star with this Instrument, and by it to find the Latitude the Ship is in.

To perform which observe the Precepts following:

1, *Note.** The 10, 30, 60, and 90 Cross, are to be used according as the Meridian Altitude is more or less; that is, if less than 10d. use the 10 Cross: if between 10 and 30d. use the 30 Cross; if between 30 and 60d. the 60 Cross, if more than 60, use the 90 Cross.

2. Having considered which Cross (according to the judged Altitude of the Object intended to be observed) is suitable, put it on the Staff, so that the flat Side of the Cross may be towards the flat or Square End of the Staff; Then.

3. Hold the flat End of the Staff (as at A) to the Corner of your Eye; there let it rest upon your Eye Bone, as near the Corner of your Eye as you can, so it doth not hinder your Sight.

4. Then look to the upper End of your Cross (as at C) for the Sun or Star, and at the lower End (at B) for the Horizon.

5. But if at the lower End of the Cross you see all Sky and no Water, then draw the Cross a little nearer to your Eye.

6. If on the contrary, you see all Water and no Sky, then slide the Cross a little farther from you.

7. Then, if you see the Center of the Sun or Star at the upper End of the Cross, and the Horizon at the lower End, the Cross stands as it ought.

8. Wait till the Sun or Star be on the Meridian, making Observations often; and as the Sun or Star riseth, draw the Cross a little nearer to your Eye.



9. If the Sun or Star be fallen, you will not see the Horizon, for the Water will hide it from you, and then Observing is over at that Time. Stir not the Cross out of its Place, only see at what deg. &c. it resteth on that Side

of the Staff belonging to it; and the Degrees and Minutes cut by the Edge of the Crofs is the Meridian Altitude or Complement thereof, according to the Word *Alt.* or *Comp.* on the Staff.

How to ufe the Fore-Staff *backwards.*

THIS is only ufed with the Sun, and for this Purpofe the Ten-Crofs hath another Piece of Wood or Ivory put acrofs it; fo that the lower Edge of this Crofs Piece lieth even with the middle of the Square Hole in the Ten-Crofs, which alfo anfwers to the middle of the Thicknefs of the Staff.

There is alfo a Plate of Brafs with a Hole in it, and fo fitted, that it will flide on and fit the Ends of the 90, 60, or 30 Crofs, thefe two Things added to the Fore-ftaff makes it fit for a backward Obfervation of the Sun, which is thus, *viz.*

1. According as the Meridian Altitude of the Sun, is more or lefs, fo ufe the 90, 60, or 30 Crofs; putting it on the Staff, the flat Side of it exactly even with the flat End of the Staff, there fcrew it faft; and at one end of the Crofs, flip on the forefaid Brafs Plate, fo as to leave a flit Sight through it, near the lower End of the Crofs.

2. Put the Ten-Crofs (having a Crofs-piece on it as aforefaid) on the Staff, the flat Side of it towards the other Crofs at the Staffs End.

3. Turn your Back to the Sun, look through the Slit in the Brafs, at the lower End of the Crofs, for the Shadow at the upper End of it, lying on the Ten-Crofs in the Line anfwering the middle of the Staff, and on each Side of the Staff.

4. At the fame Time the Horizon fhould be feen (thro' the aforefaid Slit) to lie even with the Shadow on the middle Line, in the Ten-Crofs; and at each End of it, on both Sides the Crofs.

5. In looking through the Slit in the Brafs, you muft bring the Shadow upon the middle Line, and if inftead of the Horizon you only fee Water there, then draw the

Ten

Ten Croſs nearer, till the Shadow and Horizon agree or meet in the ſaid middle Line.

6. On the contrary, looking as before, if inſtead of the Horizon you ſee Sky meet the Shadow on the middle Line; then put the Ten-Croſs from you, (till you ſee the Horizon and the Shadow meet together) on the middle Line.

7. Continue obſerving till the Sun be at the higheſt; and as the Sun riſeth, you muſt draw the Ten-Croſs nearer, in order to keep the Horizon and Shadow together on the ſaid Middle of it.

8. If the Sun be fallen (after you have continued obſerving as before directed) the Horizon will lie below the Shadow on the middle Line; then is the Obſerving finiſhed at that Time: Stir not the Ten-Croſs out of its Place, for where it now ſtands (on that Side of the Staff belonging to the Croſs at the End of it) is the Sun's Meridian Altitude, or Complement thereof, as before in obſerving forward.

Thus I have ſhewed how to take an Obſervation by the Croſs-Staff both forward and backward. The next Thing in Order, will be to ſhew how to work it; and for that Purpoſe take Notice of the following Rules.

To work an Obſervation.

1. IF the Sun or Star hath North Declination, and be on the Meridian to the Southward of you, ſubſtract the Declination from the Meridian Altitude; the Remainder is the Height of the Equinoctial or Complement of the Latitude North.

2. But if the Object obſerved hath South Declination, and be to the Southward of your Zenith, add; the Sum (if it exceed not 90 deg.) is the Height of the Equator, or Complement of the Latitude North: If the Sum exceeds 90 deg. ſubſtract 90 from it; the Remainder is the Latitude South.

3. If the Object hath North Declination, and be on the Meridian to the Northward, add the Declination

to

to the Meridian Altitude ; the Sum if it exceed not 90d. is the Height of the Equator, or Complement of the Latitude South : But if it doth exceed 90 deg. ſubtract 90d. from the ſaid Sum, the Remainder is the Latitude North.

4. If the Sun hath South Declination, and be to the Northward at Noon, ſubſtract the Declination from his Meridian Altitude ; the Remainder is the Complement of the Latitude, South.

5. When the Sun hath no Declination, the Meridian Altitude is the Complement of the Latitude North, if he be South at Noon ; and on the contrary.

6. If the Sun be in the Zenith, and at the ſame Time he hath no Declination, you are then under the Equinoctial.

7. But if the Sun hath North or South Declination, and in the Zenith, the Declination is the Latitude you are in, North or South.

8. If you obſerve the Sun or any Star upon the Meridian beneath the Pole, add the Meridian Altitude to the Complement of the Sun or Star's Declination ; the Sum is the Height of the Pole, or Latitude of the Place.

Theſe eight Rules are explained by the Examples following.

Examples for working an Obſervation in North Latitude.

Example 1. ADMIT at Sea I obſerve the Sun's Meridian Altitude to 42d. 20m. South, and at the ſame Time the Sun's Declination is 10d. 10m. North. I demand the Latitude I am in ?

		D.	M.	
Meridian Altitude————————		42	20	South
Sun's Declination ———	ſubſtract	10	10	North
The Complement of the Latitude ———		32	10	
Subſtract it from————————————		90	00	
The Latitude I am in, is —————		57	50	

Example

Example 2. Being at Sea the 22d of *May*, *Anno* 1779, I find the Meridian Altitude to be 65d. 10m. South; I demand the Latitude?

		D.	M.	
The Meridian Altitude ——— ———		65 :	10	South
The Sun's Declination———	ſubſtracted	20 :	25	North
The Complement of the Latitude———		44 :	45	
Subſtract it from ——— ——— ———		90 :	00	
The Latitude I am in, is ——— ———		45 :	15	North

Example 3. Being at Sea the 27th of *November*, *Anno* 1779, I find the Sun's Meridian Altitude to be 26 deg. 30 min. South; I demand the Latitude I am in?

		D.	M.	
The Meridian Altitude ——— ———		26 :	30	South
The Sun's Declination ——— ———	add	21 :	11	South
The Complement of the Latitude ———		47 :	41	
Subſtract it from ——— ——— ———		90 :	00	
The Latitude I am in, is ——— ———		42 :	19	North

Example 4. At Sea the 25th of *April*, *Anno* 1782, I find the Sun's Meridian Altitude by Obſervation to be 58d. 45m. South; I demand the Latitude I am in?

	D.	M.	
Meridian Altitude ——— ——— ———	58 :	45	South
The Declination ——— ——— ———	13 :	18	North
The Complement of the Latitude ———	45 :	27	
Subſtract it from ——— ——— ———	90 :	00	
The Latitude I am in, is ——— ———	44 ·	33	North

Example 5. Admit the 12th Day of *June*, 1782, I find the Sun's Meridian Altitude by Obſervation to be 80 deg. 35 min. North; I demand the Latitude I am in?

The

		D.	M.	
The Meridian Altitude		80 :	35	North
Sun's Declination	add	23 :	11	North
The Sum is		103 :	46	
From it ſubtract		90 :	00	
The Latitude I am in, is		13 :	46	North

Example 6 Admit *Auguſt* 22, 1784, the Sun's Meridian Altitude was obſerved to be 85d. 15m. North; I demand the Latitude of that Place?

		D.	M.	
The Meridian Altitude		85 :	15	North
Sun's Declination	add	11 :	32	North
The Sum is		96 :	47	
From it ſubtract		90 :	00	
The Latitude of the Place is		06 :	47	North

Example 7. Admit in a Ship at Sea, *June* 19, 1784, the Sun's Meridian Altitude is 66d. 46m. North; I demand the Latitude the Ship is in?

		M.	D.	
The Meridional Altitude		66 :	46	North
The Sun's Declination	add	23 :	28	North
Complement of the Latitude		90 :	14	
From it ſubtract		90 :	00	
The Ship is almoſt under the Equinoctial		00 :	14	North

Examples to find the Latitude, *by obſerving the Stars.*

Example 8. ADMIT I obſerve the *Bull's Eye* upon the Meridian, and find his Meridian Altitude to 50d. 30m. South; I demand the Latitude I am in?

The

	D. M.	
The Declination of the *Bull's Eye* is ——	16 : 00	North
The Meridian Altitude of the Star—— ——	50 : 30	South
The Star's Declination —— ſubtract	16 : 00	North
Complement of the Latitude, is————	34 · 30	
Subtract it from ———————— ——	90 : 00	
The Latitude I am in, is ————————	55 : 30	North

Example 9. Admit I obſerve the bright Star in the *Great Dog's Mouth*, and I find his Meridian Altitude to be 35d. 45m. South ; I demand the Latitude I am in ?

	D. M.	
The Declin. of the *Great Dog's Mouth* is	16 : 24	South
The Meridian Altitude of the Star ——	35 : 45	South
The Star's Declination ———— add	16 : 24	South
The Height of the Equator is —— ——	52 : 09	
Subtract it from —————— ——	90 : 00	
The Latitude I am in, is ——— ——	37 : 51	North

Example for working an Obſervation in South Latitude.

Example 10. ADMIT the 10th Day of *May*, *Anno* 1778, I find the Sun's Meridian Altitude by Obſervation to be 62d. 00m. North ; I demand the Latitude the Ship is in ?

	D. M.	
The Meridian Altitude ——————	62 : 00	North
The Sun's Declination ———— add	17 : 43	North
The Complement of the Latitude is——	79 : 43	
Subtract it from —— ————	90 : 00	
The Latitude the Ship is in, is ———	10 : 17	South

Example 11. Admit the 15th Day of *January*, *Anno* 1780, in Longitude 150d. Eaſt, I find the Meridian Altitude by Obſervation to be 38d. 45m. North ; I demand the Latitude the Ship is in ?

The

The Sun's Declination in the Meridian of *London*, for the 15th of *January* is 21d. 09m. the daily Difference at this Time is 11m. decreasing; therefore (in the Table of Proportion) in Page 20, you will find the Proportional Minutes to 5m, which add to the Declination in the Meridian of *London*, the Sum is 21d. 16m. South, the Sun's true Declination for the Longitude of 15d East

		D.	M.	
The Meridian Altitude		38	45	North
The Sun's Declination	subtract	21	14	South
Complement of the Latitude, is		17	31	
Substract it from		90	00	
The Latitude the Ship is in, is		72	29	South

Example 12. Admit the 12th Day of *July*, *Anno* 1783, I find the Sun's Meridian Altitude to be 66 deg. 52 min. North, I demand the Latitude?

		D.	M.	
The Meridian Altitude		66	52	North
The Sun's Declination	add	22	00	North
Complement of the Latitude is		88	52	
Substract it from		20	00	
Latitude required, is		01	07	South

xample 13. A Ship at Sea, the Sun's Declination being 15d. 30m. South, and the Sun's Meridian Altitude 80d. 45m. South, I demand the Latitude the Ship is in?

Answ, The Latitude is 6d. 15m. South.

Example 14. The Sun's Declination being 11d. 14m. South, and his Meridian Altitude 79d. 38m. South; I demand the Latitude?

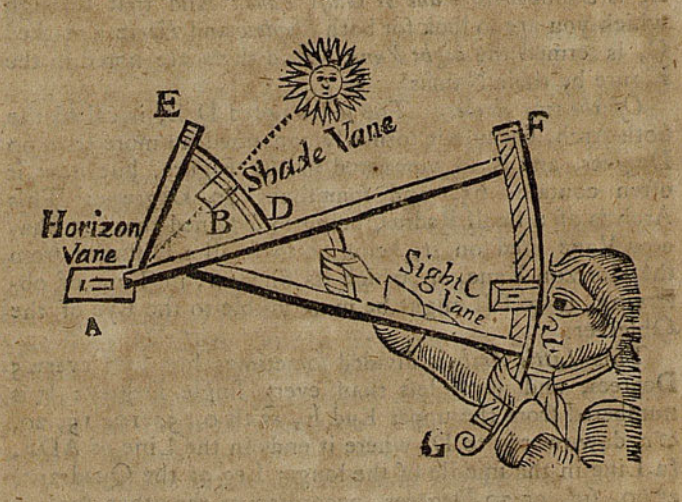
Answ. The Latitude is 0d. 52m. South.

Note 1. If you observe by the lower Part, Edge, or Limb of the Sun you must add to the Altitude taken, 16m. for the Sun's Semidiameter, and the Sum will be the true Altitude of the Sun's Center.

Note 2. If you observe by the upper Limb of the Sun, substract 16m. the Remainder is the Altitude of the Sun's ter.

The

The Figure of the QUADRANT.



The Deſcription and Uſe of the QUADRANT.

THIS Inſtrument (called a Quadrant, firſt invented by our Countryman Capt. *Davis*, and thence called *Davis's Quadrant*) is of a very commodious Form; at preſent the moſt general approved Inſtrument at Sea (at this Time *Hadley's* particularly excepted) for obſerving the Sun's Meridian Altitude.

The Form of it (as in the Figure prefixed) may be of any Radius or Length between 18 Inches and 3 Feet; but the moſt general now made, are Quadrants of 24 Inches Radius, with one Arch 65 Degrees, the other 25 Degrees, with a Glaſs-Vane and a Shadow-Vane.

The Principal Parts are three Vanes and two Arches; on which Arches the Degrees taken together make 90d. from whence it hath the Denomination of a Quadrant.

The

The *Horizon Vane* (marked in the foregoing Figure A, and with its Name) respects the Horizon in Time of Observing; that which gives the Shadow or lucid Spot marked B, is the *Shadow Vane or Glass Vane:* And that through which you are to look for both *Shadow* and *Horizon* marked C, is termed the *Sight Vane*. And these are noted in the Figure by their Names.

Of the two Arches. The lesser noted D E, is called the 60th Arch, because it formerly contained no more than 60 Degrees, and is so numbered in the Figure, but now it often contains 65, and sometimes 70 Degrees: This Arch is of a small Radius, being so designed that the Shadow Vane used on it, being at so small a Distance from the Horizon Vane, on which its Shadow, in Time of observing, is to fall might be more visible to the Eye of the Observer.

This *Little Arch* is divided sometimes but into every 5 Degrees, and never less than every single Degree: It is numbered from the upper End E, with 0, 5, 10, 15, 20, *&c.* downwards to D, where it ends in the Line of ADF, (a Line in the middle of the longer Leg of the Quadrant) at 60, 65, or 70 Degrees, according as the other Arch is divided; so that the Numbers at D and F together, must always make 90 Degrees.

The *Greater Arch* GF, is called the 30th Arch: It is of a larger Radius, that it might contain the lesser Divisions of a Degree; and being of a competent Breadth, thereon are usually described 9 Concentric Circles, intersected with three Diagonal Lines (sometimes six) in each Degree, making each Intersection two Minutes of a Degree, and sometimes one.

The *Great Arch* is divided on the Limb into Degrees by long Strokes; each again subdivided into six equal Parts by shorter Strokes; each small Division being 10 Minutes, and are numbered from the lower End G, with 5, 10, 15, *&c.* upwards to F, where it ends in the Line ADF, either at 20, 25, or 30 Degrees: The Figures always at F and K together make 90 Degrees as aforesaid.

The

The Use of Davis's QUADRANT.

THIS Inftrument is rarely ufed otherwife than to obferve the Sun's Meridian Altitude; which to perform, I thus defcribe:

1. Put the Horizon Vane A on the End, and, clofe to the Center; the Sight Vane put on the Arch GF, clofe to the Back of it, and the Shadow Vane or Glafs Vane put on the little Arch DE, clofe to the back of it, and fix the upper Edge of the Shadow Vane, to a Number of Degrees (on the Side of the 60 Arch) lefs than the Complement of the Altitude by 15 or 20 Degrees.

2. The Vanes being thus fixed upon the Quadrant, turning your back to the Sun, the End G in your Hand, and F uppermoft, look through the Sight Vane, caufing the upper Edge of the Shade of the Shadow Vane, or lucid Spot from the Glafs Vane to lie upon the upper Edge of the Slit in the Horizon Vane, where is drawn a black Line; at the fame time if the Horizon appear through the faid Slit in the Horizon Vane, the Vanes on the Quadrant ftand at the Sun's prefent Altitude.

3. But if the Sky appear inftead of the Horizon, flide the Sight Vane a little higher towards F; on the contrary, if the Sea appear inftead of the Horizon, then flide the Sight Vane lower towards G; continue fo to do till the Horizon appear through the Horizon Vane.

4. In order to obtain the Meridian Altitude (which is the greateft Altitude the Sun will have that Day, and the Thing ufed to find the Latitude) continue obferving; and as the Sun rifes the Sea will appear through the Horizon Vane; and the Sight Vane muft be flid lower accordingly. Thus continue obferving as often as may be convenient, till the Sun is at the higheft.

5. When the Sun begins to fall, the Sky will appear through the Horizon Vane, inftead of the Horizon; then defift obferving any more that Day.

6. Having thus done, add the Degrees the upper Edge of the Shade Vane ftandeth at, to the Degrees and Min. cut by the infide of the Sight Vane, their Sum is the Com-

plement of the Sun's Meridian Altitude, or the Diſtance on the upper Edge of the Sun from the Zenith, to which Sum add 16m. the Sun's Semi-diameter, and the laſt Sum is the Diſtance of the Sun's Center from the Zenith, being the true Complement of the Sun's Meridian Altitude.

Note, The upper Edge of the Shade of the Shadow Vane reſpects the upper Limb of the Sun, and the lower Edge of the ſaid Vane anſwers to the lower Limb of the Sun; ſo that obſerving by the firſt, you are to add 16 Minutes; on the contrary, obſerving by the latter, ſubtract 16 Minutes to, or from what is on the Quadrant, the Sum or Difference is the Diſtance of the Sun's Center from the Zenith, called his Zenith's Diſtance or Complement of his Meridian Altitude.

Thus I have ſhewed how to take an Obſervation with the Quadrant: I come now to ſhew how to work it. The Difference in working an Obſervation taken by the Fore-ſtaff and Quadrant is only this: By the Fore-ſtaff you take the Altitude, by the Quadrant the Complement of the Altitude, or the Diſtance of the Sun from the Zenith.

Altitude is the Diſtance of the Sun from the Horizon; therefore if you ſubtract the Complement of the Altitude from 90d. the Remainder is the Altitude; which you may uſe as in the Uſe of the Fore-ſtaff, in Pages 153 and 154.

But it is uſual to work Obſervations (made by the Quadrant) by the Complement of the Sun's Meridian Altitude; I will therefore give ſome general Rules, and ſome particular Examples for their Explanation.

The General Rules are,

1. IF the Sun hath North Declination, and is upon the Meridian to the Southward of the Obſerver, add the Sun's Declination to the Zenith Diſtance, (or Complement of the Sun's Meridian Altitude) the Sum is the Latitude you are in, North.

2. If the Sun be to the Southward of you, and hath South Declination, ſubtract his Declination from the

Zenith Diſtance, the Remainder will be the Latitude you are in, North: But if the Declination exceed the Zenith Diſtance, ſubtract the leſs from the greater, and the Remainder is the Latitude, South.

3. If the Sun be to the Northward of you, and hath South Declination, add the Sun's Declination to his Zenith Diſtance, the Sum will be the Latitude, South.

4. If the Sun be to the Northward of you, and hath North Declination, ſubtract the Sun's Declination from his Zenith Diſtance, the Remainder will be the Latitude South; but if the Declination exceed the Zenith Diſtance, ſubtract the leſs from the greater, and it gives the Latitude, North.

I might have given more general Rules; but if you underſtand thoſe eight Rules for the Uſe of the Fore-ſtaff you cannot err in theſe, in uſing the Quadrant: And for their Explanation, ſee the Examples following.

Working an Obſervation in North Latitude.

Example 1. ON the 10th of *April*, 1780, the Sun came to the Meridian in the South, and by Obſervation, found his Zenith Diſtance, or Complement of his Meridian Altitude to be 34d. 47m. that is, his upper Limb was ſo much from the Zenith; I demand the Latitude of the Place of Obſervation?

	D. M.	
Compl. of the Sun's Meridian Altitude -	34 : 47	South
The Sun's Semidiameter - - - - - -	00 : 16	
Diſtance from the Sun's Center from Zenith	35 : 03	South
Declination - - - - - - - - - add	08 : 17	North
Latitude of the Place required, is - -	43 : 20	North

Example 2. The 14th Day of *Auguſt*, *Anno* 1780, I find the Complement of the Sun's Meridian Altitude by Obſervation, to be 28d. 48m. South; I demand the Latitude the Ship is in?

	D. M.	
Comp. of the Sun's Meridian Altitude -	28 : 48	South
Sun's Semidiameter - - - - - - add	00 : 16	
Distance of the Sun's Center from Zenith	29 : 04	South
The Sun's Declination - - - - - - add	14 : 08	North
The Latitude the Ship is in, is - - - -	43 : 12	North

Example 3. *October* 3, 1780, I find the Complement of the Sun's Meridian Altitude, by Observation to be 47d. 35m. South, I demand the Latitude I am in?

	D. M.	
Comp. of the Sun's Meridian Altitude -	47 : 35	South
Sun's Semidiameter - - - - - - add	00 : 16	
Distance of the Sun's Center from Zenith	47 : 51	South
The Sun's Declination - - - substract	04 : 18	South
The Latitude the Ship is in, is - -	43 : 33	North

Example 4. The 5th Day of *November*, *Anno* 1782, I find the Complement of the Sun's Meridian Altitude by Observation to be 52d. 00m. South; I demand the Latitude the Ship is in?

	D. M.	
Comp. of the Sun's Meridian Altitude -	52 : 00	South
Sun's Semidiameter - - - - - - - add	00 : 16	
Distance of the Sun's Center from Zenith	52 : 16	South
The Declination of the Sun - substract	15 : 49	South
The Latitude the Ship is in, is - - -	36 : 27	North

Example 5. The 27th of *May* 1782, the Sun being to the Northward of me, and the Complement of his Meridian Altitude by Observation 10d. 15m. I demand the Latitude the Ship is in?

	D. M.	
Sun's Declination - - - - - - -	21 : 22	North
Comp. of the Sun's Meridian Altitude -	10 : 15	North
The Sun's Semidiameter - - - add	00 : 16	
The Sun's true Zenith Distance, substract	10 : 31	North
Latitude the Ship is in, is - - - - -	10 : 50	North

Example

Example 6. Admit on the 29th Day of *June*, *Anno* 1782, the Sun being upon the Meridian, I find, by Obſervation, his upper Limb to be 6d. 42m. to the Northward of my Zenith; I demand the Latitude I am in?

	D. M.	
Sun's Declination - - - - - - - -	23 : 15	North
Sun's upper Marg. Diſtance from Zenith -	06 : 42	North
Sun's Semidiameter - - - - - - - add	00 : 16	
Diſt. of the Sun's Center from Zenith ſub.	06 : 58	North
Latitude the Ship is in, is - - - -	16 : 17	North

Example 7. The 21ſt of *July*, *Anno* 1780, in Longitude 165 Deg. Weſt, and the Sun being upon the Meridian, I find by Obſervation, the upper Margin of the Sun is 16d. 45m. to the Northward of the Zenith; the Latitude the Ship is in is required?

	D. M.	
The Sun's Declination at *London* - - -	20 : 21	North
Proportional Min. for Longitude ſubſtract	00 : 05	
Sun's Declination in the Meridian given	20 : 16	North
Sun's Supreme Marg. Diſtance from Zenith	16 : 45	North
Sun's Semidiameter - - - - - - add	00 : 16	
Sun's Central Diſt. from Zenith ſubſtract	17 : 01	North
The Latitude the Ship is in, is - - -	03 : 16	North

Working an Obſervation in South Latitude.

Example 8. ON the 14th Day of *July*, *Anno* 1782, in Longitude 150 Deg. Eaſt, the Sun being upon the Meridian, I find the Complement of his Meridian Altitude, by Obſervation, to be 48d. 28m. North; I demand the Latitude the Ship is in?

	D. M.	
Comp. of the Sun's Meridian Altitude add	48 : 28	North
Sun's Semidiameter - - - - - - -	00 : 16	
Sun's Central Diſtance from the Zenith -	48 : 44	North
Sun's Declination for the Long. ſubtract -	21 : 44	
The Latitude the Ship is in, is - - -	27 : 33	South

Example 9. The 25th of *October*, *Anno* 1781, in Longitude 120 Deg. Weſt, the Complement of the Sun's Meridian Altitude, by Obſervation, is 27d. 29m. North; I require the Latitude the Ship is in?

	D. M.	
Comp. of the Sun's Meridian Altitude -	27 : 29	North
Sun's Semidiameter - - - - - add	00 : 16	
Sun's Central Diſtance from the Zenith -	27 : 45	North
The Declination of the Sun's Prop. add	12 : 27	South
The Latitude the Ship is in, is - - -	40 : 12	South

Example 10. Admit that on the 24th of *December*, *Anno* 1782, I find the Sun upon the South Part of the Meridian, and by Obſervation the Complement of his Meridian Altitude is 15d. 10m. I demand the Latitude the Ship is in?

	D. M.	
Comp. of the Sun's Meridian Altitude -	15 : 10	South
Sun's Semidiameter - - - - - - add	00 : 16	
Sun's Central Diſt. from the Zenith ſubtract	15 : 26	South
The Declination of the Sun - - - -	23 : 27	South
The Latitude the Ship is in, - - -	08 : 00	South

Thus much I thought neceſſary to add by way of Explanation upon the foregoing Rules, in Page 162, which exhibit and explain a more perfect and accurate Method, both in taking and working an Obſervation, than hath been formerly made uſe of.

No

Note 1. The Sun's Semidiameter here added to the Complement of its Meridian Altitude, may be placed on the Quadrant, ſo that its Addition by the Pen may be omitted; for this Purpoſe the Quadrants have on the back Edge of the little Arch (every 5 Degrees numbered, differing from thoſe on the flat Side) the Semidiameter of the Sun: So that placing the upper Edge of the Shadow Vane, to the Degree on the ſaid back Edge of the Arch, the Quadrant then ſheweth the true Complement of the Altitude, or the Diſtance of the Sun's Center from the Zenith; which prevents adding 16 Minutes after obſerving.

Note 2. There is another Contrivance now made uſe of, which is, by fixing a Convex Glaſs in ſuch a Manner in the Shade Vane, that the Diameter of the Glaſs may exactly range with the upper Edge of the ſaid Vane, and which Glaſs will then, in Time of Obſervation, caſt an illuminated Spot on a round black Spot made in the Horizon Vane: This is uſeful when the Edge of the Shadow reflected from the Shade Vane is not very conſpicuous, the Spot being diſcernable when the latter is not. The Manner is thus:

Set that Part of the Glaſs Vane, which is right againſt the Middle or Center of the Glaſs, to the Degrees on the Side of the little Arch, and then cauſe the enlightened Spot of the Glaſs to lie on the black Spot or Circle on the Horizon Vane; at the ſame Time look for the Horizon thro' it, as before directed, in Page 160; ſo you will have (obſerving by this Glaſs in the Vane) the true Complement of the Sun's Altitude, or the Diſtance of his Center from the Zenith.

The Deſcription and Uſe of the NOCTURNAL.

1. THE *Nocturnal* conſiſts of three Parts; the firſt, termed the unmoveable Part is the broadeſt and greateſt; on which is a Handle to hold it by in Time of Obſervation or uſing it.

On the fore Side of which, in the outermoft Circle, are the twelve Months, and each Month fubdivided into its refpective Days; they are counted towards the left Hand, from the Tip, or nearly fo, when you hold it erect by the Handle, and marked with their Names, or the firft Letters thereof; as *Jan.* for *January*, *Feb.* for *February*, *Mar.* for *March*, &c. Within the Circle of the Months is a Circle divided into 24 equal Parts or Hours, each Hour divided into Halves and Quarters; ufed to find the Time of full Sea or high Water.

On the back Side of this Part, are the 32 Points of the *Mariner's Compafs* South Uppermoft, and Eaft on the Left Hand; to each Point is fet the Declination of the North Star, above or under the Pole; which is known by *Und.* for *Under*, *Abo.* for *Above*.

Formerly there was made two Sorts of Nocturnals, one for the Great Bear, the other for the Little Bear: Thofe made for the Guards, of the Great Bear, or *Charles's Wain*, commonly called the two Pointers, have *February* at the Top; but thofe made for the Guards of the Little Bear, have *April* at the Top; but they are now made for both Bears in one Nocturnal, and are known by having either two Circles or Months, mark'd GB and LB, or two fhort Teeth or Indices, proceeding from the fecond or middle Part of it marked GB and LB, fignifying Great Bear or Little Bear.

2. The fecond moveable middle Part hath two Circles on it; the outermoft is divided into the 29 Days and a Half of the Moon's Age; the innermoft is divided into 24 equal Parts or Hours, each Hour fubdivided into Halves and Quarters; this Part hath a Tooth, or fhort Index proceeding from it with the Edge continued in a right Line from the Center, which is to be fet to the Day of the Month when ufed. Some have two Indices, marked G on one, and L on the other; G ftands for Great Bear, and L for Little Bear; fignifying the Nocturnal is made for both Bears, and may be ufed for either.

3. The

3. The third and moveable Part is called the Index; it is uppermoſt on the fore Side of the Inſtrument, having one Edge proceeding in a right Line from the Center, which (in the Time of Obſervation) muſt be turned to the Guards. Through all three Pieces, in the Center of the Inſtrument, is a Hole, through which you are to ſee the North Star, when the Index is turned to the Guards.

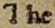
The Uſe of the NOCTURNAL.

BY it may be found the Hour of the Night, the Bearing of the Guards, and the Declination of the North Star from the Pole; by which may be found the Latitude, as ſhall be ſhewed in Order.

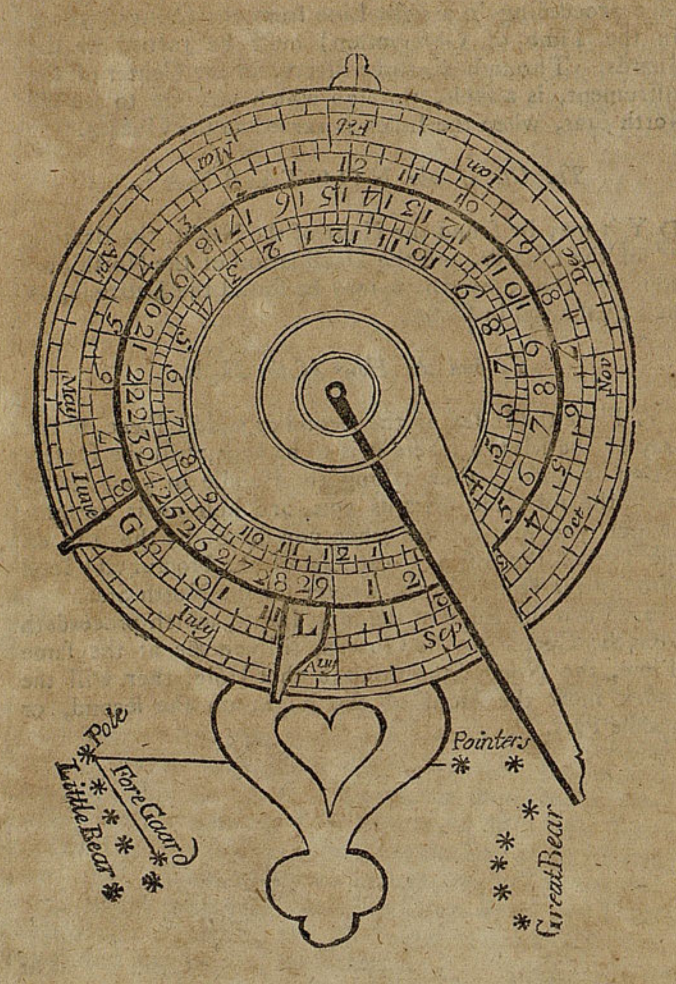
To find the Hour of the Night.

1. Place the Index of the ſecond or middle Piece, to the Day of the Month where it is to be kept, 'till the Obſervation is ended; then taking the Handle in your Hand, with the fore Side towards you, and holding it upright, (which you may diſcern when you do ſo, by the Tip on the Top of the firſt or great Part of the Nocturnal) look through the Hole into the Center for the North Star.

2. Turn the Edge of the long Index, which proceedeth from the Center to the Guards, till you ſee at the ſame Time, the North Star through that Hole, then will the Index ſhew the Hour of the Night on the ſecond, or middle Part.


The

The Figure of the NOCTURNAL.



2. To

2. To find the Bearing of the *Guards*, either of the Little or Great Bear, that is, upon what Point of the Compaſs they are, and thereby to find the North Star's Declination from the Pole.

1. Having obſerved all the particular Directions as before, in finding the Hour of the Night, you muſt ſee the North Star through the Hole, and the *Guards* by the Edge of the long Index.

2. Then look on the Back-ſide of the *Nocturnal*, what Point of the Compaſs ſtandeth againſt the aforeſaid Edge of the Index, which is the Bearing of the *Guards*; and at the ſaid Point of the *Compaſs* is figured the North Star's Declination from the Pole at that Time either above or under.

Note, If the Nocturnal is made to fit the *Old Stile* the Index muſt be adjuſted in all Problems relating to Time by fixing it eleven Days backward from that Obſervation.

Example 1. The 31ſt of *December*, at ſix of the Clock in the Morning, obſerving the *Pointers* or *Guards* of the Great Bear by the Edge of that Index: I demand their Bearing, and the Declination of the North Star.

Right againſt the Edge of that Index you obſerve with, and on the back Side of the *Nocturnal* is SW by S. the Point of the Compaſs required; and on the ſaid Point of the Compaſs is 2d. 33m. *und.* ſignifying the North Star is then 2d. 33m. under the Pole, in the Circle marked *G. B.*

Example 2. The 7th of *March*, I obſerve (according to the Directions before given) at ſeven of the Clock in the Evening, the *Fore Guard* of the Little Bear by the Edge of the long Index: I demand its Bearing, and the Declination of the North Star.

Seeing the North Star through the Hole in the Middle, and the *Guard* of the *Little Bear* by the Edge of the long Index, (note always that Edge reſpecting the Center of the Inſtrument) and the Index cutting ſeven of the Clock, on the Back-ſide of the *Nocturnal*, and againſt the ſaid Edge of the Index, is N. E. the Point of its Bearing; and on the ſaid Point is figured 0d. 35m. Abo. which ſignifieth the N. Star is then 35 Minutes above the Pole in the Circle marked L. B.

3 *To find the Moon's Southing by the* Nocturnal.

To do this, look for the Moon's Age in the outermoſt Circle, on the Middle or ſecond Piece of the Nocturnal; and right againſt it in the innermoſt Circle of the ſame Piece is the Southing.

Example. *If the Moon be* 19 *Days old, I demand her Southing.*

Right againſt 19, in the outermoſt Circle, is almoſt 3½ in the innermoſt Circle; which is half an Hour paſt three of the Clock in the Morning nearly, the Time of the Moon's coming to the South.

To find the Time of full Sea by the Nocturnal.

1. Set the ſhort Index of the middle Part which ſtands at 12, to the Time of full Sea, on the New or Full Moon (for the Place propoſed) in the innermoſt Circle of the great Piece.

2. Keeping it there, bring the long Index to the Moon's (Southing, or) Age on the middle Piece.

3. Then right againſt the long Index, and in the innermoſt Circle on the great Piece, is the Time of full Sea required.

Example. *The Moon being* 19 *Days old, I demand the Time of Full Sea at* Graveſend?

1. Bring the Index of the middle Part (which ſtands at 12) to 1½ Hour (which is N.N.E. and S.S.W. the Point of the Compaſs making Full Sea at *Graveſend*, on the New and Full Moon) in the innermoſt Circle of 24 Hours on the great Piece, keeping that faſt there.

2. Turn the long Index to 19 Days (the Moon's Age, or to 3½ Hours the Moon's Southing) on the Middle Piece.

3 Then right againſt the long Index, and in the innermoſt Circle (on the great Piece) is 5 Hours, the Time of full Sea or high Water in the Morning at *Graveſend.*

To

5. *To find the Latitude by the* Nocturnal *and* Fore Staff.

1. Find the North Star's Declination from the Pole, by obſerving with the Nocturnal, as directed in Example 1, or 2, of its Uſe, in Page 171.

2. Then at the ſame Time with a Fore-Staff, take the Altitude of the North Star.

3. If the North Star be above the Pole, ſubſtract its Declination from (if under, add to) its Altitude; the Sum or Difference is the Latitude required, North.

Example. Suppoſe on the 7th of *March*, at Seven of the Clock in the Evening, obſerving with the Nocturnal, you find the *Guard* of the Little Bear to bear NE. which is od. 35m. above the Pole, and at the ſame Time, by the Fore Staff, find the Altitude of the North Star 42d. 10m. required the Latitude of the Place?

	D. M.	
From the Altitude of the North Star -	42 : 10	
Subſtract its Declination above the Pole -	00 : 35	
Remainder is the Latitude required - -	41 : 35	North

Example 2. On the 31ſt of *December*, at Six o'Clock in the Morning, obſerving with the Nocturnal, I find the *Guards* or *Pointers* of the *Great Bear* S. W. by S. which is 2d. 33m. under the Pole; and at the ſame Time, by the Fore Staff, find the Altitude of the N. Star 45d. 22m. I demand the Latitude of the Place of Obſervation?

	D. M.	
To the Altitude of the North Star - -	45 : 22	
Add its Declination from the Pole under it	02 : 33	
Sum is the Latitude required - - - -	47 : 55	North

The Deſcription and Uſe of Gunter's Scale.

THIS Inſtrument for its quick and eaſy Diſpatch of the moſt common and uſeful Proportions, deſerves as

as generally to be known in its Ufes as by its Name: On that Account we fhall firft give a Defcription thereof, and then with as much Clearnefs and Brevity as poffible, fhew its manifold Ufes.

1. *Gunter's Scale*, (fo called from Mr. *Gunter*, its firft Contriver) is ufually made of Box Wood, commonly two Feet long, and one Inch and a half broad; on which are placed the Lines or Scales of Numbers, Sines, Tangents, *&c.* There are two Sorts, the long or flat Gunter, and the fliding Gunter: On both Sorts are the fame Lines, though differently ufed; the firft Sort with the Compaffes, the latter by fliding Pieces.

2. The Lines generally fet on *Gunter*'s are eight, and have their Names at the Right Hand End thereof, under one another, thus; Sine Rumb, Tang. Rumb, Numbers Sines, Verfed Sines, Tangents, Meridian (or Meridional Parts) and equal Parts.

3. The Sine Rumb, and Tang. Rumb, are both Points of the *Mariner's Compafs*; the firft is figured from the Left Hand towards the Right, with 1, 2, 3, 4, 5, 6, 7, and 8, at which is a Brafs Center Pin; the latter is figured thus, 1, 2, 3, and 4, at the faid Center Pin; and thence back again towards the Left-Hand with 5, 6, and 7; each Point in both Lines (where it can) is fubdivided into Halves and Quarters: Thefe two Lines are only ufed in Navigation.

4. The next under Tang. Rumb, is the Line of Numbers figured thus: Near the Left Hand End it begins at 1, and towards the Right Hand is 2, 3, 4, 5, 6, 7, 8, 9; then 1 is the middle, at which is a Brafs Center Pin going ftill on 2, 3, 4, 5, 6, 7, 8, 9, and 10, at the End where is another Center Pin: This Line is of general Ufe, and requires the larger Account, whereof take thefe three following Notes for the Line of Numbers.

Note 1. *All the Figures on this Line may be taken fingly as they ftand; or be increafed or diminifhed at Pleafure, fo it be in Decuple or ten Fold Proportion.* That is, the firft 1 may be counted for 1, or 10, or 100, or 1000, *&c.*

then

then the next 2 is accordingly 2, or 20, or 200, or 2000, &c. Again, the first 1 may be reckoned for 1 Tenth, or 1 Hundreth, or for 1 Thousandth Part, &c. then the next 2 is 2 Tenths, or 2 Hundredths, or 2 Thousand Parts, &c. So that if the First 1 be esteemed 1, the middle 1 is then 10; and two to its Right-hand is then 20, 3 is 30, 4 is 40, and 10 at the end is 100. Again, if the first 1 be counted 10, the next 2 is 20, 3 is 30, and so on, making the Middle 1 now 100; the next 2 is 200, 3 is 300, 4 is 400, and 10 at the End is now 1000.

In like Manner, if the first 1 be esteemed for 1 Tenth Part, the next is 2 Tenths, and the middle 1 is 1; and the next 2 is 2, and 10 at the End is now 10. Again, if the first 1 be counted for 100 Hundredth Part, the next 2 is 2 Hundred Parts; the Middle 1 is now 10 Hundred Parts, or 1 Tenth Part, and the next 2 is 2 Tenth Parts; and 10 at the End is now but 1 whole Number or Integer.

Note 2. *As the Figures are increased or diminished in their Value, so in like Manner must all the intermediate Strokes or Subdivisions be increased or decreased:* That is, if the first 1 (at the left Hand) be counted 1, then 2 (on the right Hand of it is 2; and each Subdivision between them now is one Tenth Part, and so all the Way to the Middle 1, which now is 10; the next 2 is 20. Now the longer Strokes between 1 and 2 are to be counted from 1, thus 11, 12, (where is a Brass Pin) then 13, 14, 15, (something a longer Stroke than the rest) then 16, 17, 18, 19, and 20, at the Figure 2: And all the shorter Strokes between those longer are now each to be counted for a Tenth Part; from the Middle 1 to the next 2, now 20; from whence the longer Strokes between the Figures are Units, thus 21, 22, 23, &c. to 3, which now is 30; and the shorter Strokes between them, each now is 2 Tenth Parts of an Integer: From 3, each short Stroke (or little Division) is five Tenth Parts of an Unit.–

Again,

Again, If 1 at the left Hand be Ten, the Figures between it and the middle 1 are common Tens, and the Subdiviſions (between each Figure) are Units, and from the Middle 1 to 10 at the End, each Figure is ſo many Hundreds; and between theſe Figures, each longer Diviſion is 10 and from the Middle 1 to 2, each leſs Diviſion is an Unit; and from 2 to 3, each leſs Stroke is two Units; from the Figure 3 to the End, each ſhorter Stroke is five Units.

Some Scales are otherwiſe ſubdivided, which the Reader will attend unto, and thence very eaſily aſcertain the Value of each Subdiviſion, if what is aforementioned be duly underſtood.

Note 3. On the *Line of Numbers* may be counted a Number of any Denomination; whether Meaſure, as Inches, Feet, Yards, Miles, Leagues, &c. or Weights, as Hundreds, Pounds, Ounces, &c. or Money, as Pounds, Shillings, Pence, &c. or Time, as Years, Months, Days, Hours, &c. provided always the Integer be divided, or ſuppoſed to be divided decimally, or into Tens.

5. Next under Numbers, is the Line of *Sines*, beginning at the left Hand, and figured thus, 1, 2, 3, &c. to 10; then 20, 30, 40, &c. to 90, ending at the right Hand, where is a braſs center Pin. Theſe Figures never change their Value or Denomination, being here (and in all other Lines under it) called Degrees.

From the Beginning of this Line to 10 Degrees, each Degree is commonly divided into 12 Parts, by longer and ſhorter Strokes, making each 5 Minutes; from 10 Degrees to 20, each ſmaller Stroke is 10 Minutes; from 20 to 30 Degrees each is fifteen Minutes from thence to 60 Degrees, ſome are twenty, but the moſt are thirty Minutes; and from 60 to 80 Degrees, each Diviſion is a Degree; 80 and 90 are ſo near together, that they admit but of one Stroke between them, which is for 85 Degrees.

6. Next to the Line of Sines, is the *Line* of *Verſed Sines*, beginning at the right Hand againſt 90, (in the Sines) and from thence figured towards the Left-hand; thus

thus, 10, 20, 30, 40, *&c.* ending at (the left Hand End) about 169 Degrees; the Subdivifions are thus, from 10 to 30, each is 2 Degrees; from thence to 90, it is fingle Degrees; from thence to 120, it is half Degrees; and from thence to the End it is divided each into 15 Minutes.

7. *Under verfed Sines* is the *Line of Tangents*, beginning at the left Hand, as the *Sines* do; from thence figured to the right Hand thus, 1, 2, 3, *&c.* to 10; and fo on, 20, 30, 40, and 45 at the right Hand, where is a little Brafs Center Pin, juft under and even with 90 in the *Sines*; from thence back again it is figured, 50, 60, 70, 80, *&c.* to 89; ending at the Left Hand End, where it began at 1 Degree: The Subdivifions of the Line are the fame of thofe of the Sines.

8. Next to the Line of *Tangents*, and under it is the *Line of Meridional Parts*, beginning at the right Hand, and numbered thus, 10, 20, 30, *&c.* to the left Hand, where it ends at 87 Degrees. This Line, with the *Line of equal Parts* under it, are ufed together, only in the *Mercator's Sailing*; the uppermoft Line contains the Degrees of the Meridian or Latitude in a *Mercator's* Chart, and the lower is the Equator, and contains the Degrees of Longitude.

9. Thefe eight Lines, thus defcribed, are fet on the *Sliding Gunter*, but not in the fame Order, being fome on one Side, and fome on the other: Alfo the Line of Numbers, Sines, and Tangents, are fet double, that is, one on each Side, as the middle Piece flides; which middle Piece is fo contrived, as to flip to and fro eafily; to flide out, and to be put in, any Side uppermoft, in order to range thefe Lines together or againft one another, moft proper for folving the Queftions wrought by the *Sliding Gunter*; of which, this fhort Defcription may fuffice.

I. *The Use of* Gunter's Scale, *both single and sliding, in* Arithmetic.

IN order to a right Underſtanding of the Uſe of this Scale, it is neceſſary to number well on it; that is, to find readily a Place repreſenting any given Number, Point, or Degree, &c. but chiefly on the Line of Numbers, which is as follows:

PROBLEM I. *To find a whole Number on the Line of Numbers.*

Rule 1. LOOK the firſt Figure of the given Number among the figured Diviſions.

2. For the ſecond Figure, count ſo many Tenths, (or longer Strokes) from the figured Diviſions, towards the right Hand, as are Units in the ſaid ſecond Figure.

3. Then for the third Figure, count from the laſt Tenth (repreſenting the ſecond Figure) ſo many leſſer Strokes (or Centeſms) as that Figure hath Units.

4. In like Manner, for the fourth Figure, count from the laſt Centeſm ſo many Thouſands (or leſſer Strokes) as are Units in it; and ſo on, for more Figures, though four Figures, or Thouſands, are as many as can well be diſcerned on a two-foot Gunter.

5. This done, the laſt Place is the Point where the propounded Number is repreſented.

Example 1. To find the Point in the Line of Numbers that doth repreſent 12.

According to the Rule above, I take the Diviſion at the Figure 1 (in the Middle of the Line of Numbers) for the firſt Figure of 12, the propounded Number; then for 2 the ſecond Figure I count 2 Tenths (or longer Strokes to the right Hand) from the ſaid Stroke at 12; and this laſt is the Point repreſenting 12, where moſt commonly is a ſmall Braſs Center Pin, being oft in Uſe.

Example

Example 2. Suppoſe the Point repreſenting 22, on the Line of Numbers, was required to be found ?

The firſt Figure in the Number 22, being 2, I take the Diviſion in the Figure 2 for it; and for the ſecond Figure 2, I count 2 Tenths onwards : And that is the Point repreſenting 22.

Example 3. I deſire to know the Point on the Line of Numbers that repreſents 144.

The firſt Figure being 1, I take the Diviſion at the Middle 1 for it ; the ſecond Figure being 4, I count 4 Tenths onwards, and that is 140 ; from thence count 4 Centeſms farther, for the third and laſt Figure ; this laſt Place is the Point repreſenting 144.

Example 4. Let it be required to find, on the Line of Numbers, the Point repreſenting 1728.

For the firſt Figure 1, take the Middle 1 for the ſecond Figure 7, count, as before onward, 7 Tenths, and that is 1700 : Then for 2, the third Figure, count 2 Centeſms from the laſt, and it repreſents 1720 : Laſtly, for the fourth Figure 8, eſtimate 8 Thouſand Parts from the laſt. This Point laſt found repreſents 1728 ?

PROB. II. *To find a Fraction, or broken Number, on the Line of Numbers.*

THE Fractions to be found on this Line muſt always be Decimals ; as theſe, .1 .01 .001 ; .2 .02. 002, &c. that is, $\frac{1}{10}$, $\frac{1}{100}$, $\frac{1}{1000}$; $\frac{2}{10}$, $\frac{2}{100}$, $\frac{2}{1000}$, &c. either of Inches Feet, Yards, Miles, or the like ; alſo in Weight, or Time, or any other Denomination whatſoever.

So that all other Fractions muſt be reduced into Decimals, before they can be found on the Line of Numbers ; and being ſo reduced, they are expreſſed and found upon this Line as whole Numbers by the Rule in *Problem* I. and

PROB. III. *To perform Multiplication by the Line of Numbers.*

The RULE is,

AS 1 is to the Multiplier, so is the Multiplicand to the Product.

Now to work this, or any Proportion on the *Gunter*, this is a general Rule.

1. Extend the Compasses from the first Term to the second Term.

2. That Extent laid the same Way from the third Term, will reach to the fourth Term, or Thing required.

By the *Sliding Gunter* thus;

1. Set the first Term counted on the sliding or middle Piece, right against the second Term counted on the fixed Piece.

Then seek the third Term, (always on the same Piece the first Term was counted upon) and against it on the other Part, is the fourth Term, or Thing required.

Example 1. What is the Product of 8 multiplied by 4?

The Analogy or Proportion is this: As 1 is to 4, so is 8 to the Product.
Or it is thus: As 1 is to 8, so is 4 to the Product.

1. By the *Gunter* with Compasses, thus;

Extend the Compasses from 1 to 4; that Extent laid from 8 the (same Way) reacheth to 32, the Product of 8 multiplied by 4.

Or the Extent from 1 to 8, being laid from 4, reacheth to 32, the Product as before.

2. By

2. By the *Sliding Gunter*, thus;

Set 1 at the Beginning of the middle or ſliding Piece, right againſt 4 on the fixed or outſide Piece; then againſt 4 on the firſt, is 32 on the ſecond, the Product required.

Or (ſet as before) 1 againſt 8; then againſt 4 on the firſt, is 32 on the ſecond, the Product, as before.

Example 2. What is the Product of 16, multiplied by 5?

The Proportion to work it by, is this: As 1 is to 5, ſo is 16 to the Product.

1. By *Gunter* with Compaſſes, it is thus;

The Extent from 1 to 5 being laid from 16, reacheth to 80 the Product required.

2. By the *Sliding Gunter* thus;

Set 1 on the middle Piece, againſt 5 on the outſide Piece, then againſt 16 on the firſt, is 80 on the ſecond, the Product as before.

PROB. IV. *To perform Diviſions by the Line of Numbers.*

The Rule or Proportion is thus;

AS the Diviſor is to 1, ſo is the Dividend to the Quotient.

Example 1. If the Dividend be 64, and the Diviſor 4, what is the Quotient?

To do this, the Proportion is: As 4 is to 1, ſo is 64 to the Quotient required.

1. By *Gunter* with Compaſſes, thus;

The Extent from 4 to 1 (laid the ſame Way) from 64 reacheth to 16, the Quotient required.

2. By the *Sliding Gunter*, thus;

Set 4 on the outſide Piece, againſt 1 on the Middle Piece; then againſt 64 on the firſt, is 16 on the ſecond, which is the Quotient as before.

Example 2. How often is 144 contained in 1728?

To do this, the Proportion is thus: As 144 is to 1, ſo is 1728 to the Anſwer, *viz.* 12.

1. By *Gunter* with Compaſſes, thus;

The Extent from 144 to 1, reacheth from 1728 to 12, the Quotient and Anſwer required.

2. By the *Sliding Gunter*, thus;

Set 144 on the outſide Piece, againſt 1 on the middle Piece; then againſt 1728 on the firſt, is 12 on the ſecond, which is the Quotient as above.

PROB. V. *To reduce a Vulgar Fraction to a Decimal by the Line of Numbers.*

TO perform this, the Proportion is thus: As the Denominator of the given Fraction is to its Numerator, ſo is 1 to the Decimal Fraction required.

Example. Suppoſe it be required to reduce $\frac{3}{4}$, a Vulgar Fraction, into a Decimal Fraction?

Note, A Decimal Fraction hath for its Denominator an Unit, with as many Cyphers as its Numerator hath Places, and the Proportion to find the Numerator is thus; As 4 is to 3, ſo is 1 to the Numerator of the Decimal Fraction required.

1. By *Gunter* with Compaſſes, thus;

The Extent from 4 or 3 reacheth (the ſame Way) from 1 to 75, or $\frac{75}{100}$ the Decimal Fraction required.

2. By

2. By the *Sliding Gunter*, thus;

Set 4 on the outside Piece, against 3 on the middle Piece; then against 1 on the first is 75, or $\frac{75}{100}$, on the second, the Decimal Fraction required to be found: So that .75, or $\frac{75}{100}$ is equal in Value to $\frac{3}{4}$.

PROB. VI. *Of Continual Proportion, or Geometric Progression: which is unto two given Numbers, to find a 3d, 4th, 5th, &c Number, in a continual or continued Proportion by the Line of Numbers.*

The Analogy by which it is effected, is thus;

AS the first given Number is to the second, so is the second to the third, and so is that third to a fourth, and that fourth to a fifth, *&c.*

Example. Let the two Numbers given be 2 and 4, unto which it is required to find a third, fourth, *&c.* Proportional.

For the Performance hereof, the Rule is thus;

As 2 is to 4, so is 4 to a third; and so is that third to a fourth, *&c.*

1. By *Gunter* with Compasses, thus;

The Extent from 2 to 4 reaches from 4 to 8, the third, and from 8 to 16, the fourth; and from 16 to 32, the fifth proportional Number; and so on, to as many as you please: So that 2, 4, 8, 16, 32, *&c.* are Numbers in continued Geometric Proportion as was required.

2. By the *Sliding Gunter*; thus

Set 2 on the middle Piece, to 4 on the outside Piece: then against 4 on the first, is 8 on the Second, for the third Proportional; and against 8 on the first is 16 on the second, the fourth Proportional; and in like manner against 16 is 32, the fifth Proportional, as was required: And so on for more.

PROB. VII. *Of the Rule of Three Direct, or three Numbers being given, to find a fourth in a direct Proportion by the Line of Numbers.*

The Analogy whereby this is performed, is thus:

AS the first Number is to the second, so is the third to the fourth Number required.

Example 1. If the Diameter of a Circle be 7 Inches, and the Circumference thereof 22, what is the Circumference of a Circle, whose Diameter is 14 Inches?

To perform this, the Analogy is thus; as 7 is to 22, so is 14 to the Circumference required.

1. By *Gunter* with Compasses, thus;

The Extent from 7 to 22 (laid the same Way) from 14, will reach to 44, the Circumference of the Circle, whose Diameter is 14, which was required.

2. By the *Sliding Gunter*, thus;

Set 7 on the middle Piece, against 22 on the outside Piece; then against 14 on the first, is 44 on the second, which is the Circumference as above.

Example 2. If the Circumference of a Circle be 3.14 or $3\frac{14}{100}$, and its Diameter 1, what will the Diameter of another Circle be, whose Circumference is 44?

The Proportion is, as $3\frac{14}{100}$ is to 1, so is 44 to the Diameter required.

1. By *Gunter* with Compasses, thus;

The Extent from $3\frac{14}{100}$ to 1, reacheth from 44 to 14 nearly, the Diameter required.

2. By the *Sliding Gunter*, thus;

Set $3\frac{14}{100}$ on the outside Piece, right against 1 on the middle Piece; then against 44 on the first, is 14 on the second, which is the Diameter required, as before.

Note,

Note, In the *Rule of Three Direct*, if the third Number be greater than the first, then will the fourth Number be greater than the second: But if the third Number be less than the first, then the fourth will be less than the second.

Example 3. If 30 Acres of Land be worth 25 Pounds a Year, how much a Year will 54 Acres be worth?

To do this, or any Question in the *Rule of Three*, always in the Proportion let the first and third Numbers or Terms be of one Kind or Denomination, and then it is thus: As 30 Acres is to 25 Pounds, so is 54 Acres to 45 Pounds.

1. By the *Gunter* with Compasses, thus;

The Extent from 30 to 25, reacheth from 54 to 45, the yearly Rent required.

2. By the *Sliding Gunter*, it is thus;

Set 30 against 25, then against 54 on the first, is 45 on the second, as before.

By this Time the Reader is, we presume, so well acquainted in the Way of working a Proportion on the Line of Numbers, with Compasses or without, that it is needless to express it in Words any more, being always the same: We shall therefore for the future set down the Proportion, leaving the Manner of its Operation to Practice, except in Cases where the working differs from what went before.

PROB. VIII. *Of the Rule of Proportion Inverse, or three Numbers given to find a fourth in an Inverse Proportion, or in the backward Rule of Three, by the Line of Numbers.*

IN this Rule you must note, if the third Number be greater than the first, then will the fourth be less than the second. But,

2. If

2. If the third be lefs than the firft, the fourth is to be greater than the fecond.

3. And to refolve Queftions in the backward Rule of Three, the Proportion is thus;

As the third Number is to the fecond, fo is the firft to the fourth.

Example. If 72 Pioneers make a Trench in 48 Hours, in how long Time will 54 Pioneers make it?

By the Directions above, this is the Proportion: As 54 Men is to 48 Hours, fo is 72 Men to 64 Hours, the Anfwer to the Queftion, from whence you may conclude that 54 Men will perform as much in 64 Hours, as 72 Men in 48 Hours.

PROB. IX. *Of Duplicate Proportion, or three Numbers being given, to find a fourth in a Duplicate Proportion by the Line of Numbers.*

THIS Rule is chiefly ufed in Proportion of Lines to Superficies, *&c.* wherein the firft and fecond Terms are to be of one Kind or Denomination.

Example 1. If the Diameter of a Circle be 1, and its Area or Content 0 78539, what is the Content of a Circle whofe Diametei is 14?

To perform this, the firft and fecond Terms, (by the Note above) are to be Lines; that is, the Diameters given, and then the Proportion is thus: As 1 is to 14; fo is 0.785 to a fourth; and fo is that fourth to the Content required.

1. By *Gunter* with Compaffes, thus;

The Extent from 1 to 14 reacheth from 0.785 to 11; and the fame Extent laid the fame Way from 11 reacheth to 154, the Content required.

2. By

2. By the *Sliding Gunter*, it is thus;

Bring 1 on the middle Piece right againſt 14 on the outſide Piece; then againſt 0.785 on the firſt, is 11 on the ſecond; and againſt 11 on the firſt, is 154 on the ſecond, the Content as before.

Example 2. If the Diameter of a Circle be 7, and its Area 38.5 what is the Area of a Circle whoſe Diameter is 12? *Anſwer* 113. For,

As 7 is to 12, ſo is 38.5 to 66; and ſo is 66 to 113, the Area required.

Example 3. If the Diameter of a Circle be 1, and its Area 0.785, what is the Diameter of a Circle whoſe Area is 154? *Anſwer*, 14 is its Diameter.

In this, the Proportion is a Superfices to a Line, which is thus: As Area 0.785 is to Area 154, ſo is the Square of the Diameter 1, to the Square of the Diameter required.

1. By *Gunter* with the Compaſſes, it is thus;

The Extent from 0.785 to 154 reacheth from 1 to 196, the Square of the Diameter required.

Then divide the Space between 1 (always the Middle 1) if the Number of Places be odd, but if even, the firſt 1) and 196 into two equal Parts; the Foot of the Compaſſes in the Middle reſteth at 14, the Diameter of the Circle, whoſe Area is 154.

2. By the *Sliding Gunter*, it is thus;

Set 0.785 againſt 154, and againſt 1 on the firſt, is 196, on the ſecond; then find the Middle between 1 and 196, which is at 14, the Diameter as before.

Example 4. The Diameter of a Circle being 1, and its Area 0.785, what is the Diameter of a Circle whoſe Area is 113? *Anſwer*, 12 is the Diameter required.

For as 0.785 is to 113: ſo is 1 to 144; the Middle between it and 1, is to 12, the Diameter required.

PROB.

PROB. X. *Of Triplicate Proportion, or three Numbers being given, to find a fourth in a Triplicate Proportion by the Line of Numbers.*

THIS Problem concerneth the Proportion of Lines to Solids, and the contrary; in which always make the firſt and ſecond Term to be of one Denomination.

Example 1. If an Iron Bullet weigh 9 Pounds, and its Diameter be 4 Inches, what is the Weight of another Iron Bullet, whoſe Diameter is 6 Inches.

To perform this, the firſt and ſecond Terms are to be Lines, that is, the given Diameters; and then the Proportion is thus:

As 4 is to 6, ſo is 9 to 13.5; and ſo is 13.5 to 20.2: and ſo is 20.2 to 30 3; that is, 30 Pounds and 3 Tenths of a Pound, which is the Weight required.

That is, 1. By *Gunter* with Compaſſes, thus;

The Extent from 4 to 6 being laid three Times from 9, will reach to 30 Pounds 3 Tenths, the Weight required.

And, 2. By the *Sliding Gunter*, it is thus;

Set 4 againſt 6, and againſt 9 on the firſt is 13.5 on the ſecond; then againſt 13.5 on the firſt, is 20.2 on the ſecond; and againſt 20.2 on the firſt, is 30.3 on the ſecond, that is 30 Pounds 3 Tenths, as before.

Example 2. If an Iron Bullet 1 Inch Diameter, weigh Pounds 0.1406 Parts, what is the Weight of another whoſe Diameter is 4 Inches, it being of the ſame Metal? Anſwer, 9 Pounds. For,

As 1 is to 4, ſo is 0.1406 to 0.562; and ſo is 0.562 to 2.25; and ſo is 2,25 to 9 Pounds, the Weight required.

Example

Example 3. If a Gun 6 Inches Bore require 11 Pounds of Powder, how much will ſerve a Gun 4 Inches Bore? Anſwer, Pounds 3.25 Parts.

For, As 6 is to 4, ſo is 11 to 7.3; and ſo is 7.3 to 4.88; and ſo is 4.88 to 3.25; which is Pounds 3.25 Parts of a Pound, or Pounds $3\frac{1}{4}$ of Powder.

Example 4. If an Iron Bullet 1 Inch Diameter weigh Pounds 0.1406 Parts, what ſhall the Diameter of that be, which weigheth 9 Pounds of the ſame Metal? Anſwer,

For it is thus: As 0.1406 is to 9, ſo is 1 to 64, the Cube of the Diameter required; then divide the Space between 1 and 64 into 3 equal Parts, and the Foot of the Compaſſes in the firſt $\frac{1}{3}$ Part from 1 reaching to 4, the Diameter of the Iron Shot weighing 9 Pounds.

II. *The Uſe of the Line of Numbers, commonly called* Gunter's Line, *in meaſuring Superficies, as Board, Glaſs, Land,* &c.

PROB. I. *The Length and Breadth of any Square, or Long-ſquare, Superficies being given, to find the Area or Content thereof.*

THE Proportion is this; As 1 is to the Breadth, ſo is the Length to the Content.

Example 1. A Plane Superficies, as a Board or Plank, being given to be meaſured, the Breadth thereof is 15 Inches, and its Length 61 Inches; what is the Content of it? Anſwer, 915 Inches.

For, as 1 is to 15, ſo is 61 to 915 Inches, the Content required.

Note, Such as the Breadth and Length are, ſuch is the Content; ſo that if the Breadth and Length be Feet, the Content is Feet; if Perches, then Perches, *&c.*

Example

Example 2. A Piece of Wainscot in Form of a long Square, whose Length is Feet 15.5 Parts, and Breadth Feet 2.25 Parts; what is the Content? *Answer*, Feet 34.87 Parts. For as 1 is to 2.25 so is 15.5 to 34.87; that is, Feet 34 and 87 Parts is the Content.

PROB. II. *The Breadth and Length of a Superficies being given in one Kind of Measure, to find the Content thereof in another Kind of Measure.*

TO do this the Proportion is thus: As the Number contained in the Area of Unity in the required Kind of Measure, is to the Breadth; so is the Length to the Content desired.

Example 3. A Plank or Board 15 Inches broad, 61 Inches long, I demand the Content of it in Feet? *Answer*, Feet 6.35 Parts of a Foot. For you must note in a Foot Superficial, or a Square Foot, is 144 square Inches, and therefore the Proportion is thus: As 144 is to 15 Inches, so is 61 Inches to Feet 6.35 Parts of a Foot, the Content.

Example 4. A Piece of Land in Form of a Long Square, whose Breadth is 30 Perches, Length 183 Perches: What is the Content in Acres? *Answer*, Acres 34.31 Parts.

Note, 160 Perches is an Acre, and the Proportion is thus: As 160 Perches is to 30 Perches, so is 183 Perches to Acres 34.43 Parts of an Acre, the Content of the Piece of Land.

Example 5. A Piece of Painting in Form of a Long Square, whose Breadth in Feet is 3.5, and its Length 21 Feet, how many Square Yards is the Content? *Answer*, Yards 8.16 Parts of a Yard.

Note, 9 Feet is a Square Yard, and the Proportion is thus;

As 9 is to 3.5 Feet, so is 21 Feet to Yards 8.16 Parts of Yard, the Content.

PROB.

PROB. III. *The Breadth of a Superficies being given in one Kind of Meaſure, and the Length in another; to find the Content in the greater Meaſure.*

TO do this, the Proportion is thus: As ſo many of the leſſer Kind of the given Meaſure, as is equal to the Length of one of the required Meaſure, is to the given leſſer Meaſure, ſo is the given greater Meaſure, to the Content in the Meaſure required.

Example 6. Admit there be a Board of 10 Inches broad, and 20 Feet long, I demand the Content in Feet? *Anſwer*, Feet 16.6 Tenths of a Foot.

For the Proportion is thus: As 12 is to 10 Inches, ſo is 20 Feet to 16.6 Tenths.

Example 7. If a Board or Plank be 15 Inches broad, and 27 Feet long, what is the Content of it in Feet? *Anſwer*, Feet 33.75 Parts of a Foot, or $33\frac{3}{4}$ Feet. For as 12 is to 15 Inches, ſo is 27 Feet to 33.75 Parts.

Example 8. A Board $7\frac{1}{2}$ Inches broad, and $29\frac{1}{4}$ Feet long, what is the Content in Feet? *Anſwer*, Feet 18.28. For, it is as 12 is to $7\frac{5}{10}$; ſo is $29\frac{25}{100}$; to Feet 18.28 Parts.

Example 9. A Piece of Land in Form of a long Square, whoſe Breadth is 30 Perches, and Length in Chains 15.25 Links (meaſured by a Chain of 4 Perches in 100 Links) I demand the Content thereof in Acres? *Anſwer*, Acres 11.44. For it is, As 40 is to 30 Perches, ſo is Chains 15.25 to Acres 11.44 Parts of an Acre.

PROB. IV. *The Breadth of a Superficies being given to find how much in Length will make a Foot, a Yard, a Perch, or an Acre*, &c.

TO do this, take this general Rule: As the Breadth is to a Foot, a Yard, *&c.* ſo is a Foot, a Yard, *&c.* to that Length which will make a Foot, a Yard, *&c.*

Example

Example 10. If a Board be $7\frac{1}{2}$ Inches broad, how much in Length will make a Foot ſquare? Anſwer, Inches 19.2 Tenths of an Inch.

For the Proportion is thus: As 7.5 is to 12, ſo is 12 to Inches 19.2 Tenths in Length, which will make a Foot.

Example 11. A Plank is 30 Inches broad, how much in Length will make a Foot? Anſwer, Inches 4.8 Tenths in of an Inch.

For as 30 Inches is to 12, ſo is 12 Inches to 4.8 Tenths in Length to make a Foot.

Example 12. A Pane of Glaſs being in Breadth Feet 2.5 Tenths, how much in Length will make a Foot? Anſwer, 4 Tenths of a Foot. For it is thus;

As 2.5 is to 1 Foot, ſo is 1 Foot to 0.4 Tenths of a Foot in Length to make a Foot.

Example 13. A Piece of Matting being 27 Inches broad how much in Length will make a Yard ſquare? Anſwer 48 Inches, or 4 Feet. For it is thus;

As 27 Inches is to 36 Inches, ſo is 36 Inches to 48 Inches: But if the Breadth be given in Feet, that is, if for 27 Inches it be $2\frac{1}{4}$ Feet, or 2.25 Feet, then it is thus;

As 2.25 is to 3 Feet, ſo is 3 Feet to 4 Feet in Length, to make a Yard ſquare.

PROB. V. *The Diameter of a Circle being given, to find the Circumference.*

THE Analogy or Proportion is thus: As 1 is to 3.142 ſo is the Diameter to its Circumference.

Example 14. If the Diameter of a Circle be 15 Inches, what is the Circumference of it? Anſwer, Inches 47.13 Parts of an Inch.

For, as 1 is to 3.142, ſo is 15 Inches to Inches 47.13 Parts, the Circumference required.

PROB.

PROB. VI. *The Circumference of a Circle being given, to find its Diameter.*

THE Proportion is this: As 3.142 is to 1, ſo is the Circumference to its Diameter.

Example 15. The Circumference of a Circle being 44 Feet, what is the Diameter thereof? *Anſwer* Feet 14, for it is,

As 1.142 is to 1, ſo is 44 Feet, to Feet 14 the Diameter.

PROB. VII. *The Diameter of a Circle being given, to find its Area, or ſuperficial Content.*

The Proportion is thus:

AS 1 is to the Diameter, ſo is 0.7854 to a fourth Number, and ſo is that fourth Number to the ſuperficial Content required.

Example 16. The Diameter of a Circle being 15 Inches, what is the Content of it? *Anſwer*, Inches 176.7 Parts.

For it is, as 1 to 15, ſo is 0.7854 to 11.78; and ſo is 11.78 to 176.7 the ſuperficial Content required.

PROB. VIII. *The Circumference of a Circle being given, to find the ſuperficial Content of it.*

The Proportion is this:

AS 1 is to the Circumference, ſo is 0.07958 to a fourth Number, and ſo is that fourth Number to the ſuperficial Content required.

Example 17. If the Circumference of a Circle be 44 Inches, what is the Content? *Anſwer*, Inches 154.06 Part of an Inch. For it is,

As 1 is to 44, ſo is 0.7958 to 3.5; and ſo is 3.5 to Inches 154.06, the Content required.

III. *The Uſe of the Line of Numbers, in ſolid Meaſure, ſuch as Timber, Stone, Gauging, &c.*

PROB. I. *The Side of a Square Solid being given in Inches, to find how much in Length will make a Foot Solid.*

THE Proportion is thus: As the given Side is to 12, ſo is 12 to a fourth Number; and ſo is that fourth Number to the Length required to make a Foot Solid.

Example 1. A ſquare Piece of Timber or Stone, whoſe Breadth and Depth are each 8 Inches; how much in Length will make a Foot Solid? *Anſwer*, 27 Inches, or 2 Feet 3 Inches: For it is, as 8 is to 12, ſo is 12 to 18; and ſo is 18 to 27 Inches in Length, to make a Foot.

Example 2. A ſquare Piece of Timber or Stone, whoſe Side is 2 Feet or 24 Inches; how much in Length will make a Foot? *Anſwer*, 3 Inches. For it is, as 24 is to 12, ſo is 12 to 6; and ſo is 6 to 3 Inches in Length, to make a Foot Solid.

PROB. II. *The Side of a Square Solid given in Foot Meaſure, (that is, the Decimal Foot, or a Foot divided into* 100 *equal Parts) to find how much in Length will make a Foot Solid.*

THE Proportion is thus: As the given Side is to 1, ſo is 1 to a fourth Number; and ſo is that fourth Number to the Length required to make a Foot Solid.

Example 3. A ſquare Piece of Timber whoſe Side is Feet 1.52 Parts; how much in Length will make a Foot Solid? *Anſwer*, 0.432 Parts of a Foot. For it is as 1.52 is to 1, ſo is 1 to 0.658; and ſo is 0.658 to 0.432 Parts of a Foot.

PROB.

PROB. III. *The Breadth and Depth of a Solid, whose two Ends are equal long Squares, (viz. Rectangles) being given in Inches, or in Foot Measure; to find how much in Length will make a Foot Solid.*

THE Proportion for Inches is thus: As 12 is to the Breadth, so is the Depth to a fourth Number: Then,

As that fourth Number is to 12, so is 12 to the Length in Inches to make a Foot Solid.

2. The Proportion for Foot-Measure is thus: As 1 is to the Breadth, so is the Depth to a fourth Number; and then, as that fourth Number is to 1, so is 1 to the Length in Foot-Measure, to make a Foot Solid.

Example 4. A Piece of Timber or Stone, whose Breadth is 11, and Depth 19 Inches; how much in Length will make a Foot? *Answer*, Inches 8.27 Parts. For it is as 12 is to 11, so is 19 to 17.4: And then say, as 17.4 is to 12, so is to 12 to Inches 8.27 Parts in Length, to make a Foot Solid.

Example 5. A Piece of Timber, in Breadth Feet 0.75 Parts, and Depth Foot 1.25 Parts; how much in Length will make a Foot Solid? *Answer*, Foot 1.06 Parts. For it is, as 1 is to 0.75, so is 1.25 to 0.94: Then say, as 0.94 is to 1, so is 1 to Foot 1.06 Parts in Length, to make a Foot Solid.

PROB. IV. *The Side of a Square Solid, and its Length being given, to find the Content.*

1. WHEN the Side is given in Inches, and Length in Feet, the Proportion is thus: As 12 is to the given Side, so is the Length to a fourth Number; and so is that fourth Number to the Content in Feet.

When the Side and Length are both given in Foot-Meafure, the Proportion is thus. As 1 is to be given Side; fo is the Length to a fourth Number; and fo is that fourth Number to the Content required.

Example 6. A Square Piece of Timber, whofe Side is 9 Inches, and Length 35 Feet; how many Feet of Timber are in it? *Anfwer*, Feet 19.68 Parts. For it is,

As 12 is to 9, fo is 35 to 26.25; and fo is 26.25 to Feet 19.68 Parts, the Content required.

Example 7. A Pirce of Timber 16 Inches fquare, and 28 Feet long, how much is the Content? *Anfwer* 50 Feet.

For it is, as 12 is to 16, fo is 28 to 37.3, and fo is 37.3 to 49.8 Feet, the Content of the Piece of Timber.

Example 8. A Stone, Feet 2.75 Parts Square, and Feet 7.50 Parts long, how much is the Content? *Anfwer* Feet 56.72 Parts.

For it is, as 1 is to 2 75, fo is 7.50 to 20.6; and fo is 20.6 to Feet 56.72 Parts, the Content required.

PROB. V. *The Lenghth, Breadth, and Depth of a Square Solid being given, to find the Solid Content.*

1. IF the Breadth and Depth be given in Inches, and the Length in Feet, the Proportion is thus: As 12 is to the Breadth, fo is the Depth to a fourth Number. Then fay, As 12 is to that fourth Number, fo is the Length in Feet to the Content in Feet.

2. When the Length, Breadth and Depth are all given in Foot-Meafure, then the Proportion is thus: As 1 is to the Breadth, fo is the Depth to a fourth Number: And then again fay, As 1 is to that fourth Number, fo is the Length to the Content in Feet.

Example 9. If a fquare Piece of Timber be in Breadth 19 Inches, Depth 11 Inches, and 20 Feet long; how much is the Solid Content? *Anfwer*, Feet 29.03 Parts.

For it is thus: As 12, is to 19; fo is 11, 17.4 Then

fay,

ſay, as 12 is to 17.4 ſo is 20 to Feet 29.03 Parts the Content required.

Example 10. A Stone 20 Inches broad, 13 Inches deep, and Feet $15\frac{1}{4}$ or 15 $\frac{25}{100}$ Feet in Length; How much is the Content? *Anſwer*, Feet 27.5.

For it is, as 12, is to 20; ſo is 13, to 21.67: And then as 12 is to 21.67; ſo is 15.25, to 27.5, that is $27\frac{1}{2}$ Feet is the Content.

Example 11. A ſquare Piece of Timber, Feet 1.25 broad, Feet 0.56 deep, and 36 Feet long; how much is the Content? *Anſwer*, Feet 25.20 Parts, or 25 $\frac{20}{100}$ Feet. For it is,

As 1, is to 1.25; ſo is 0.56, to 0.7; and then ſay, as 1 is to 0.7; ſo is 36 to Feet 25.2 Tenths, the Content required.

PROB. VI. *The Diameter of a Cylinder being given, to find how much in length will make a Foot Solid.*

1. IF the Diameter be given in Inches, the Proportion is thus: As the given Diameter is to 13.531; ſo is 12 to a fourth Number; and ſo is that fourth Number to the Length required to make a Foot Solid.

2. When the Diaameter is given in Foot Meaſure, the Proportion is thus: As the given Diameter is to 1.128; ſo is 1 to a fourth Number, and ſo is that fourth Number to the Length, which will make a Foot Solid.

Example 12. A round Piece of Timber, or Stone, being 15 Inches Diameter; how much in Length will make a Foot Solid? *Anſwer*, Inches 9.76 Parts of an Inch. For it is,

As 15 is to 13.531; ſo is 12 to 10.82, and ſo is 10.82 to Inches 9.76 Parts, or $9\frac{76}{100}$ Inches: But ſuppoſing the Diameter of the ſame to be taken in Foot Meaſure, then the Queſtion is Foot 1.25 Parts; and how much will make a Foot Solid? *Anſwer*, Foot 0.81 Parts of a Foot.

For it is thus: As 1.25, is to 1.28; ſo is 1 to 0.902; and ſo is 0.902, to Foot 0.815 Parts, or $\frac{815}{1000}$ Foot to make a Solid Foot.

PROB. VII. *The Circumference of a Cylinder being given, to find how much in Length will make a Foot Solid.*

1. WHEN the Circumference is given in Inches, the Proportion is,

As the Circumference is to 42.54, so is 12 to a fourth Number, and so is that fourth Number to the Length re-required to make a Foot Solid.

2. But if the Circumference be given in Foot Measure, then the Proportion is,

As the Circumference is to 3.545, so is 1 to a fourth Number; and so is that fourth Number to the Length, to make a Foot Solid.

Example 3. If a round Stone or Tree, be 44 Inches about, how much in Length will make a Foot? *Answer*, Inches 11.22 Parts. For it is,

As 44 is to 42.54, so is 12 to 11.6; and so is 11.6 to Inches 11.22 Parts of an Inch, or $\frac{22}{100}$ Inches.

But suppose the same was measured by Foot-Measure, and the Circumference found to be Feet 3.67 Parts, how much in Length will make a Foot? *Answer*, Foot 0.933 Parts, or $\frac{933}{1000}$, For it is thus;

As 3.67, is to 3.545; so is 1, to 0.966; and so is 0.966 to Foot 0.933 Parts, or $\frac{933}{1000}$ Foot.

PROB. VIII. *The Diameter and Length of a Cylinder being given, to find the Solid Content.*

1. WHEN the Diameter is given in Inches, and Length in Feet, the Proportion is thus;

As 13.531 is to the Diameter, so is the Length to a fourth Number; and so is that fourth Number to the Solid Content in Feet.

2. If the Diameter and Length are both given in Foot-Measure, then the Proportion is thus;

Course

As 1.128 is to the Diameter, so is the Length to a fourth Number; and so is that fourth Number to the Content required.

Example 14. A round Piece of Timber 10 Inches thro' and 30 Feet long; how many Feet of Timber are in it? *Answer*, Feet 16.38 Parts. For it is, as 13.531 is to 10, so is 30, to 22.16; and so is 22.16, to Feet 16.38 Parts of a Foot, or 16   Feet.

But suppose the same Piece is measured by Foot Measure; then it is Feet to 0.83 Parts through, and the Work is thus:

As 1.128 is to 83, or 0.83, so is 30 to 22.16; and so is 22.16 to Feet 16.38 Parts, or 16 $\frac{38}{100}$ Feet as before.

PROB. IX. *The Circumference and Length of a Cylinder, being given, to find the Solid Content.*

1. IF the Circumference be given in Inches, and the Length in Feet, the Proportion is thus: As 42.54 is to the Circumference, so is the Length to a fourth Number; and so is that fourth Number to the Solid Content in Feet.

2. When the Circumference and Length are both given in Foot-Measure, if the first Term be made 3.545 (instead of 42.54) the former Words will serve.

Example 15. A round Stone or Tree, being 30 Inches about, and 25 Feet long, how many Feet Solid are in it? *Answer*, Feet 12.43 Parts. For it is thus: As 42.54 is to 30, so is 25 to 17.63; and so is 17.63 to Feet 12.43 Parts or 12$\frac{43}{100}$ Feet.

Now the Compass about being taken in Foot-Measure is Feet 2.50 Parts, and the Proportion is, as 3.545 is to 2.50, so is 25 to 17.63; and so is 17.63 to Feet 12.43 Parts, or 12$\frac{43}{100}$ Feet as above.

Note, When Timber Tapers, that is, bigger at one End than at the other, it is usual to take the Breadth and Depth in the Middle of its Length, and by them to measure the Pieces as if both Ends were of a Bigness.

Note 2. The Proportions for Foot Meaſures are the ſame when all the Dimenſions are taken in Inches; only the Solid Content found is Inches.

Note 3. The Solid Content in Inches divided by 1728, the Quotient is Feet; but if divided by 282, or 231, the firſt is Beer, the latter Wine Gallons; and how to divide by the Line of Numbers was ſhewn in Problem IV. of the firſt Uſes of the Gunter, in Page 181.

PROB. X. *The Diameter of a Caſk at the Head and Bung, and alſo in Length being givem in Inches, to find its Content in Gallons, Beer, or Wine.*

The Rule is thus:

1. AS 1 is to 0.7, ſo is the Difference of the Bung and Head Diameter, to a fourth Number, which being added to the Head Diameter, the Sum is a mean Diameter, reducing the Caſk to a Cylinder. Then ſay;

2. As the Gage Point (which for Beer or Ale is 18.95, but for Wine 17.15) is to the mean Diameter, ſo is the Length, to a fourth Number; and ſo is this fourth Number, to the Content in Gallons required.

Example. 16. Suppoſe a Caſk whoſe Length is 40 }
The Diameter at the - - - - - - - - { Bung 28 / Head 20 } Inch.
What is its Content in Gallons, Beer, or Wine?

Anſwer, 73 Gallons Beer, and Wine Gallons 89.1 Tenth.

Bung Diameter - - - - - - - - - -	28 Inches
Head Diameter - - - - - - - - - -	20 Inches
Their Difference - - - - - - - - - -	8 Inches

Then as 1, is to 0.7; ſo is 8, to 5.6; which added to 20, the Head Diameter, makes 25.6 for the mean Diameter: Then ſay,

As

As $\left\{\begin{matrix}18.95\\17.15\end{matrix}\right\}$ is to 25.6; ſo is 40, to $\left\{\begin{matrix}54\\59.71\end{matrix}\right\}$ and ſo is $\left\{\begin{matrix}54\\59.71\end{matrix}\right\}$ to $\left\{\begin{matrix}73 \text{ Beer}\\89.12 \text{ Wine}\end{matrix}\right\}$ Gallons.

1. By *Gunter* with Compaſſes, thus;

1. The Extent from 1 to 0.7 will reach the ſame Way from 8 to 5.6; which being added to 20; the Head Diameter, make 25.6 from the mean Diameter: Then

2. The Extent from 18.95 (the Gauge Point of Beer) to 25.6 will reach from 40, to 54; and that Extent turned over again reaches to 73, the Content in Beer Gallons.

In like Manner the Extent from 17.15 (the Gauge Point of Wine) to 25.6, being laid twice from 40, will reach to 89.12 the Wine Gallons.

2. By the *Sliding Gunter*, thus;

1. Set 1 againſt 0.7, and againſt 8 on the Firſt, is 5.6 on the Second; which added to 20 (the Head Diameter) makes 25.6 for the mean Diameter: Then

2. Set 18.95 (the Gauge Point for Beer) on the Firſt, againſt 25.6 on the Second; then againſt 54 on the Firſt, is 73 on the Second, the Content in Beer Gallons.

Alſo, if you ſet the Gauge Point for Wine 17.15 againſt the mean Diameter 25.6, then againſt the Length of the Caſk 40 on the Firſt, you will find 59.71 on the Second; and againſt 59.71 on the Firſt, will be had on the Second 89.12 the Content in Wine Gallons.

PROB. XI. *The Length of a Ship's Keel and Breadth at the Beam being given to find her Tonage.*

IT is the Practice of Shipwrights about *London*, to multiply the Length of the Keel, and Breadth and Half Breadth at the Beam, into one another, and to divide the laſt Product by 94, whoſe Quotient they count for the Ship's Tonage; from whence I frame the following Proportions to be wrought by the Line of Numbers.

1. As

1. As 188 is to the Breadth, ſo is the Breadth to a fourth Number: Then ſay,

2. As 1 is to that fourth Number, ſo is the Length to the Tonage required.

Example 17. Suppoſe a Ship 72 Feet by the Keel, and 24 Feet by the Beam: I demand her Tonage? *Anſwer*, Tons 220.6 Tenths neareſt. See the following Work;

As 188 is to 24, ſo is 24 to 3.06, and then,

As 1 is to 3.06, ſo is 72 to Tons 220.6 Tenths.

1. By *Gunter* with Compaſſes, thus;

1. The Extent from the given Number 188, to the Breadth of the Beam 24, will reach from (the ſaid Breadth) 24 to 3.06. Then,

The Extent from 1 to 3.06, will reach from the Length of the Keel 72, to the Tons 220.3 Tenths, the Tonage required.

Or more briefly thus: The Extent from 13.71 (which is the Square Root of the given Number 188) to the Breadth of the Beam 24, being turned over twice from the Length of the Keel 72, reacheth to Tons 220.3 as before.

2. By the *Sliding Gunter*, thus;

1. Set the given Number 188, againſt the Breadth of the Ship 24, then againſt the ſaid Breadth 24 on the firſt is 3.06 on the ſecond: Then,

2. Set 1 againſt 3.06, and againſt the Length of the Keel 72 on the firſt, is Tons 220.3 Tenths on the ſecond, as before.

PROB. XII. *To find the Tonage of a Box, Bale or Caſe, having it's Length, Breadth and Depth given.*

The RULE is this,

1. AS 66 is to the Breadth, ſo is the Depth to a fourth Number: Then,

2. As 1 is to that fourth Number, ſo is the Length to its Tonage required.

Example

Example 18. A Case or Bale being 6 Feet broad, 4 Feet deep, and 10 Feet long, I demand its Tonage? *Answer*, Tons 3.60 Parts. For it is thus;

1. By *Gunter's Scale* with Compasses.

1. The Extent from the given Number 66 to the Breadth 6, reacheth from the Depth 4 to 0.363: Then,

2. The Extent from 1 to the last found Number 0.363, being laid from the Length 10, reacheth to 3.63; that is 3 Tons, and 63 Parts of 100, or $\frac{63}{100}$ Tons.

By the *Sliding Gunter*, thus;

1. Set the given Number 66, against the Breadth of the Bale or Case 6; then against the Depth of it 4 on the first, you will find 0.363 on the second, a fourth proportional Number: Then,

2. Set 1 against the said Proportional Number 0.363, and against the Length of the Bale or Case 10 on the first, will be found on the second, 3.63, or 3 $\frac{63}{100}$, the Tonage of the Bale or Case proposed.

Note; That 66 Feet is the Content of a Case that will inclose two *English* Butts, but the Cantlings of them are better than a third Part; therefore allowing 26 Feet for the Cantlings, the remaining 40 Feet are counted 1 Ton. And the Rule is,

1. By the *Gunter* with Compasses, for the aforesaid *Examp.*

1. The Extent from the given Number 40, to the Breadth of the Case or Bale 6, will reach from the Depth 4 to 0.6, a fourth Proportional Number: Then,

2. The Extent from 1, to the said fourth Number 0.6, will reach the same Way, from the Length 10, to 6 Tons, the Content of the Case or Bale required.

2. By the *Sliding Gunter*, thus;

1. Set the given Number 40, against the Breadth of the Bale or Case 6, then against the Depth of it 4, on the first, is 0.6 on the Second, a fourth Proportional Number: Then,

2. Set 1 against the said Proportional Number 0.6, and against the Length of the Bale or Case 10 on the First, you

you will find on the Second 6, the Tonage of the Bale or Caſe propoſed.

PBOB. XIII. *The Diameeer of a Globe being given, to find the Solid Content.*

The RULE.

AS 1, is to the Diameter; ſo is 0.5236, to a fourth Number; and ſo is that fourth Number to a fifth; and ſo is this fifth, to its ſolid Content required.

Example 19. A Globe whoſe Diameter is 8 Inches, what is the ſolid Content? *Anſwer*, Inches 268. For it is wrought thus:

As 1 is to 8, ſo is 0.5236, to 4.19; and ſo is 4.19, to 33.5; and ſo is 33.5, to 268 Inches the ſolid Content of the Globe.

IV. *The Uſe of the Line of Numbers in Gunnery.*

PROB. I. *The Diameter and Weight of any Piece of Ordnance being known, to find the Weight of any other being of the ſame Metal and Shape, and its Diameter known*

Like Solids are in Proportion, as the Cubes of their homologs Sides. Therefore the Rule is thus:

AS the Diameter of the known Gun, is to the Diameter of the Gun whoſe Weight is required; ſo is the Wight of the known Gun, to a fourth Number, and ſo is that fourth to a fifth; and ſo is that fifth to the Weight required.

Example 1. Suppoſe a Braſs Saker, whoſe Diameter is Inches 11.5 Tenths, and Weight 1900 Pounds; what will a Braſs Gun weigh, whoſe Diameter is Inches 8.75 Parts? *Anſwer* 837.5 Pounds. For it is thus:

1. By *Gunter's Scale* with Compaſſes,

The Extent from the Diameter 11.5 to the Diameter 8.75, being laid three Times from the Weight 1900, will reach to 837.5 Pounds, the Weight of the Gun required. And,

2. By the *Sliding Gunter.*

Set the Diameter 11.5, againſt the Diameter 8.75: then againſt the Weight 1900 on the Firſt, is 1445; on the

the Second ; and againſt 1445 on the Firſt, is 1100 on the Second Alſo againſt 1100 on the Firſt, is 837.5 Pounds, the Weight required, on the Second.

PROB. II. *Having the Diameter and Weight of one Piece of Ordnance, and the Diameter of another Piece of another Metal given ; to find the Weight of the laſt, it being of the ſame Shape with the formor.*

The RULE is thus ;

1. FIND the Weight of the Piece as if it had been of the ſame Matal as the propounded Piece by the laſt Problem, in Page 204 : Then,

2. Conſider the Proportional Weights of Metals, which are known by the following Table of ſpecific Gravity, eſtimated from the lateſt and moſt approved Experiments.

Caſt Lead is to	Caſt Braſs	as 11.26 is to	8.208
	Caſt Iron		7.135
	Marble		2.7
	Flint Stone		2.621
Caſt Iron is to	Caſt Braſs	as 7.135 is to	8.208
	Marble		2.7
	Flint Stone		2.621

The Specific Gravity of *Engliſh* Pebble is 2.696, which is heavier than Flint Stone, and very near the Weight of Marble ; Pebble Stone is 2.601 ; *Portland* Stone 2.57, and Common Stone 2.5.

3. Having the Weights of both Pieces in one Sort of Metal, you muſt then Proportion their Weight according to their different Metals, by the Proportional Numbers of thoſe Metals, and then it is done.

Example 2. If a Braſs Saker of Inches 11.5 Tenths Diameter, weight 1900 Pounds ; what will an Iron Gun (of the ſame Shape) weigh, whoſe Diameter is Inches 8.75 Parts ? *Anſwer*, 728 Pounds. The Operation is thus :

1. I find by Prob. I. in Page 204, that a Braſs Piece of Inches 8.75 Parts Diameter, will weigh 837.5 Pounds ; but becauſe this Piece is Iron, and the Proportion of Braſs to Iron (as aboveſaid) is as 8.208 is to 7.135 ; therefore ſay,

2. As

2. As 8.208 is to 7.135, ſo is 837.5 to 728 Pounds, the Weight of the Iron Gun required.

PROB. III. *By knowing the Allowance of Powder for one Gun, to find how much of the ſame Powder is requiſite for another Gun.*

The RULE.

AS the Diameter of the Bore of the Gun, whoſe Allowance is known, is to the Diameter of the Gun whoſe Allowance is required; ſo is the Allowance given, to a fourth Number, and ſo is that fourth, to a fifth, and ſo is the fifth, to the Allowance required.

But note; here it is underſtood that both Guns are alike fortified, that is, that they ſhall have the ſame Proportion in Weight and Thickneſs of Metal.

Example 3. If a Saker of Inches 3.5 Tenths Bore require 4 Pounds of Powder, what will a Demi-Cannon of Inches 6.5 Tenths Bore require? *Anſwer*, Pounds 25.62 Parts. For it is thus:

As 3.5 is to 6.5, ſo is 4 to 7.44; and ſo is 7.44 to 13.80; and ſo is 13.80 to Pounds 25.62 Parts, the Weight of Powder for the Demi-Cannon, in Proportion to the given Saker. But ſuppoſe the Weight of the Saker to be 1600, and the Weight of the Demi-Cannon 6000; what Allowance of Powder muſt it then have?

I. By Problem I. Find the Weight of the Demi-Cannon in Proportion to the Saker's Weight, which is thus:

1. As 3.5 is to 6.5, ſo is 1600 to 1297; and ſo is 2971 to 5517, and ſo is 5517 to 10246 Pounds, the Weight of the Demi-Cannon, requiring Pounds 25.62 Parts of Powder for its Loading. But ſeeing its Weight is ſuppoſed to be 6000, ſay,

2. As 10246 is to 6000, ſo is 25.62 to Pounds 15, the due Allowance of Powder for the Demi-Cannon of Inches 6.5 Tenths Bore, weighing 6000 Pounds, at the Rate of a Saker Inches 3.5 Tenths Bore weighing 1600 Pounds, and requiring four Pounds of Powder.

PROB.

PROB. IV. *Having the Diameter and Weight of one Bullet, and the Diameter of another Bullet given, to find the Weight of the latter.*

The RULE.

THE Weight of Bullets (of the ſame Metal) are in Triplicate Proportion of their Diameters, and wrought by the Directions in Problem X. of the firſt Uſes of the *Gunter*, in Pages 188 and 189.

Example 4. If an Iron Bullet 4 Inches Diameter weigh 9 Pounds; what will an Iron Bullet of 6 Inches Diameter weigh? *Anſwer*, Pounds 30.375 Parts. For it is thus;

As 4 is to 6, ſo is 9, to 13.5, and ſo is 13.5 to 20.25; and ſo is 20.25 to Pounds 30.375 Parts.

PROB. V. *Two Bullets, equal in Diameter, but of different Metals; by the Diameter and Weight of the one, to find the Weight of the other.*

The RULE.

1. AS the Proportion of one Metal is to the other, ſo is the Weight of the given Bullet to the Weight of the Bullet required.

Example 5. Suppoſe an Iron Bullet of 6 Inches Diameter, and weigh Pound 30.375 Parts; what will a Flint Stone Bullet of the ſame Diameter weigh? *Anſwer*, Pounds 11.158 Parts. The Operation is thus;

By Problem II. of Gunnery (in Page 205) the Proporion of Iron to Flint Stone is as 7.135 is to 2.621: therefore it is,

As 7.135 is to 2.621, ſo is 30.375 to Pounds 11.158 Parts, the Weight of the Stone Bullet.

PROB.

PROB. VI. *Having the Diameter and Weight of a Bullet of one kind of Metal, and the Diameter of any Bullet of any other given, to find the Weight of the latter.*

The RULE.

1. FIND the Weight of it (by Problem IV.) as if it was the ſame Metal.

2. Then find its Weight according to the Proportion of the Metals by the late *Problem*, and it is done.

Example 6. If an Iron Bullet 4 Inches Diameter, weigh 9 Pounds; what is the Weight of a Leaden Bullet 6 Inches Diameter? *Anſwer*, Pounds 47.93 Parts; according to the following Operation:

1. As 4 is to 6, ſo is 9 to 13.5; and ſo is 13.5 to 20.25; and ſo is 20.25 to Pounds 30.375 Parts, if it had been Iron, but as it is Lead, ſay,

2. As 7.135 is to 11.26, ſo is 30.375 to Pounds 47.93 Parts, the Weight being Lead.

V. *The Uſe of* Gunter's Scale *in* Navigation; *and firſt in* Plane Sailing.

CASE. I.

The Courſe and Diſtance ſailed being given; to find the Difference of Latitude and Departure from the Meridian.

To do this, the Proportions are theſe:

AS Radius is to the Diſtance, ſo is the Sine of the Courſe to the Departure from the Meridian.

2. As Radius is to the Diſtance, ſo is the Sine Complement of the Courſe to the Difference of Latitude.

Note, The Radius according to the Nature and the Proportion, may be any of theſe.

8. Points

8 Points	on the Line of	Sine Rhumbs.
4 Points		Tangent Rhumbs.
90 Degrees		Sines.
45 Degrees		Tangents.

And for Conveniency, that each Proportion may ſtand in one Line.

Let S.	ſtand for	Sine
S. c.		Sine Complement
T.		Tangent
T. c.		Tangent Complement
Crs.		Courſe
Diſt.		Diſtance ſailed
Diff. Lat.		Difference of Latitude
Dep.		Depart. from the Meridian.

Example. If a Ship Sails SW. by S. 104 Minutes from Latitude 1d. 45m. North, I demand what Latitude ſhe is in, and her Departure from the Meridian?

As S.8P.isto104M.ſoisS. { 3 / 5 } Points to { Dep. 58M. / Diff.Lat.86M.

1. By *Gunter* with Compaſſes, thus;

The Extent from 8 Points on the Line of Sine Rhumbs, to 104 Min. (on the Line of Numbers) will reach the ſame Way from 3 Points (on the Line of Sine Rhumbs) to 58m. (on the Line of Numbers) which is the Departure from the Meridian; and the Compaſſes kept at the ſame Diſtance, will reach (the ſame Way) from 5 Points (on the Line of Sine Rhumbs) to 86 Minutes (on the Line of Numbers) which is the Difference of Latitude.

Note; The Courſe is 3 Points, becauſe SW. by S. is 3 Points from the Meridian or South; and 5 Points is the Complement of the Courſe, becauſe S.W by S. is 5 Points from the Parallel or Weſt; underſtand the like in any other Courſe.

By the Sliding Gunter, thus:

Slide 104 min. on the Middle Piece, against 8 Points, on the Line of Sine Rumbs, on the lower outside Piece; then against 3 Points on the first, is 58 Minutes on the second, the Departure from the Meridian, and against 5 Poin*s on the first, is 86 Minutes on the second, the Difference of the Latitude.

	D.	M.	
Latitude sailed from - - - - - - -	01	45	North
Difference of Latitude 86 Minutes, or	01	26	South
u btract gives the Latitude required -	00	19	North

CASE II.

The Course and Difference of Latitude being given, to find the Distance sailed, and the Departure from the Meridian.

To do this, the Proportions are these:

1. As the Sine Comp. of the Course is to the Difference of Latitude, so is Radius to the Distance run.
2. As the Sine Complement of the Course is to the Difference of Latitude, so is the Sine of the Course to the Departure from the Meridian.

Example. Suppose a Ship sails N. N. E. from the Latitude of 2d. 15m. South, and then by Observation is in Latitude 1d. 22m. North; what is her Distance sailed and Departure from the Meridian?

	D.	M.	
Latitude sailed from - - - - - - - -	02	15	South
Latitude by Observation - - - - - -	09	22	North

Added, gives the Difference of Latitude 03 : 37 which reduced into Minutes by multiplying by 60, is 217 Min. Then;

As S. 6 Pts. is to 217 M. so is S. { 8 / 2 } Pts. to { 235 the Dist. / 90 the Dep

CASE

CASE III.

The Course and Departure from the Meridian being given, to find the Distance run, and the Difference of Latitude.

This is performed by these Proportions.

1. As the Sine of the Course is to the Departure from the Meridian, so is Radius to the Distance sailed.

2. As the Sine of the Course is to the Departure from the Meridian, so is the Sine Complement of the Course to the Difference of Latitude.

Example. If a Ship sails SE by E. from 1d. 10m. North Latitude, till her Departure be 92 Minutes, what is her Distance sailed, and Latitude she is in?

As S. 5 Pts. is to 92 M. so is S. { 8 / 3 } Pts. to { 110 Dist. / 61 Diff.L.

	D.	M.	
Latitude sailed from - - - - - - -	01	10	North
Difference of Latitude 61 Minutes, or -	01	01	South
Substracted, gives the Latitude the Ship is in	00	9	North

CASE IV.

The Distance run, and Difference of Latitude being given, to find the Course and Departure from the Meridian.

The Proportions are these:

1. AS the Distance sailed is to the Radius, so is the Difference of Latitude to the Sine Complement of the Course.

2. As the Radius is to the Distance sailed, so is the Sine of the Course to the Departure from the Meridian.

Example. Admit a Ship sails between the S. and W. 98 Leagues from the *Lizard*, in 49d. 57m. North Latitude, and then by Observation is in 46d. 27m. North Latitude, what is her Course and Departure from the Meridian?

 D. M.

	D. M.
Latitude ſailed from ————————————	49 : 57 North
Latitude by Obſervation—————————	46 : 27 North
The Difference of Latitude - - - - -	03 : 30 or 70L.

1. As 98 Leagues, is to Sine of 90 Degrees, ſo is 70 Leagues to Sine 45d. 30m. whoſe Complement 44d. 30m. is the Courſe from the South Weſtward, that is, South Weſt neareſt: Then,

2. As Sine 90 Degrees is to 98 Leagues, ſo is Sine 44d. 30m. to 68.4 Leagues, the Departure from the Meridian.

1. By *Gunter* with Compaſſes.

1. The Extent from 98 Leag. on the Line of Numbers, to 90 Degrees on the Line of Sines, will reach the ſame Way from 70 Leag. on the Line of Numbers, to 45 Deg. 30 Min. on the Line of Sines; which being ſubſtracted from 90 Deg. leaves 44d. 30m. for the Courſe.

2. The Extent from 90 Degrees on the Line of Sines, to 98 Leagues, on the Line of Numbers, will reach from 44d. 30m. on the Line of Sines, to 68.4 Leagues, on the Line of Numbers, which is the Departure from the Meridian.

2. By the *Sliding Gunter.*

1. Bring 98 Leagues on the Line of Numbers on the middle Piece, againſt 90 Degrees on Line of Sines, on the out-ſide Piece; then right againſt 70 Leagues on the Firſt, is 45 Deg. 30 Min. on the Second, which is the Complement of the Courſe, and ſubſtracted from 90 Deg. gives 44d. 30m. which is near four Points from the South towards the Weſt, or South Weſt.

2. And as it now ſtands, againſt 44d. 30m in the Line of Sines on the outſide Piece, is 68.4 Leagues in the Line of Numbers, on the middle Piece, which is the Departure from the Meridian.

CASE V.

The Diſtance run, and the Departure from the Meridian being given, to ſind the Courſe and Difference of Latitude.

The

The Proportions are as follow :

1. AS the Diſtance ſailed is to Radius ; ſo is the Departure from the Meridian, to the Sine of the Courſe.

2. As Radius, is to the Diſtance ſailed, ſo is the Sine Complement of the Courſe, to the Difference of Latitude.

Example. A Ship ſails 354 Minutes between the North and Eaſt from 1d. 19m. South Latitude, until her Departure from the Meridian be 150m. what is her Courſe, and what Latitude is ſhe in ?

1. As 354 Minutes is to Sine 90d. ſo is 150 Minutes to Sine 25d. ſo that the Courſe is N. Eaſtward, or NNE. a quarter Eaſt.

2. As S. 90d. Degrees is to 354 Minutes, ſo is Sine 65 Degrees, to 323 Minutes, the Difference of Latitude.

	D. M.	
Latitude ſailed from is - - - - -	01 : 19	South
The Difference of Lat. 323 Minutes, or	05 : 23	North
Subſtracted, gives the Latitude the Ship is in	04 : 04	North

ſo that the Ship hath croſſed the Equator.

CASE VI.

The Difference of Latitude and Departure from the Meridian being given, to find the Courſe and Diſtance run.

To do this, theſe are the Proportions :

1. AS the Difference of Latitude is to the Departure from the Meridian, ſo is Radius, to the Tangent of the Courſe.

2. As the Sine of the Courſe is to the Departure from the Meridian, ſo is Radius to the Diſtance ſailed.

Example. Sailing between the North and Weſt, from a Port in 1d. 59m. South Latitude, and then arriving at another Port which is in 3d. 8m. North Latitude, and 209 Minutes to the Weſtwad of the firſt Port. I demand the Courſe and Diſtance from the firſt Port to the ſecond.

 D. M.

	D. M.
Latitude of the first Port - - - -	1 : 59 South
Latitude of the second Port - - -	3 : 08 North
Added, gives the Difference of Latitude	5 : 07 or 307m.

1. As 307 Min. is to 209 Min. so is Tangent 45 Deg. to Tangent 34 Deg. 15 Min. the Course North Westward, or NW. by N. nearest.

2. As S. 34 Degrees 15 Minutes, is to 209 Minutes, so is S. 90 Degrees to 307 Minutes, the Distance between the two Ports.

1. By *Gunter* with Compasses, thus:

1. The Extent from 307 Min. to 209 Min. on the Line of Numbers will reach from 45 Deg. on the Line of Tangents (that now being the Radius) to 34 Degrees 15 Min. on the same Line of Tangents, which is the Course from the Meridian.

Note, When the Difference of Latitude is greatest, the Course is less than 45 Degrees from the Meridian.

But when the Departure from the Meridian is greatest, the Course is more than 45 Degrees from the Meridian.

2. The second Canon or Proportion for the Distance run, is wrought as in the second and third Case, in Pages 210 and 211.

2. By the *Sliding Gunter*, thus:

1. In this Case place the middle Piece in such a Manner, that a Tangent Line may slide against a Tangent Line, and also Numbers against Numbers: Then bring 307 Min. on the Line of Numbers on the middle Piece, against 209 Min. on the Line of Numbers on the outside Piece, and against 45 Degrees on the Line of Tangents, on the middle Piece, will be 34 Degrees 15 Minutes on the Tangents on the outside Piece, which is the Course required.

2. For the Distance, the Manner of working is the same as has been shewn in Cases First, Second, and Third.

To resolve a Traverse by *Gunter's* Scale.

Example 1. A Ship in 40 Degrees North Latitude, and 5 Degrees 14 Minutes West Longitude, sails first S. E. by S. 68 Minutes, then S. W. by W. 35 Minutes, and then W. N. W. 75 Minutes: I demand the Course and Distance from the first Place of Departure, and what Latitude and Longitude she is in?

To do this, First find the Difference of Latitude and Departure from the Meridian, for each several Course, as directed in Case I. of Plane Sailing, in Pages 208 and 209.

2. Collect the several Differences of Latitude into two Sums, *viz* the Northing into one, and the Southing into another, and in like Manner, the several Departures either East or West, taking the Difference of the Northing and Southing, for the Difference of Latitude, and the Difference of the Easting and Westing for the Departure from the Meridian.

3. Having now the Difference of Latitude and the Departure from the Meridian known, the Course and Distance may be found in the Sixth Case of Plane Sailing, in Pages 213 and 214.

4. The Difference of Longitude may be found by this Proportion.

As the Sine Complement of the Middle Latitude is to the Departure from the Meridian, so is Radius to the Difference of Longitude. See the Work following.

1. Course, as S. 8 Pts. is to 68, so is S. { 3 to $37\frac{8}{10}$ E.ing; 5 to $56\frac{5}{10}$ S.ing }

2. Course, as S. 8 Pts. is to 35, so is S. { 5 to $45\frac{7}{10}$ W.ing; 3 to $30\frac{6}{10}$ S.ing }

3. Course, as S. 8 Pts. is to 75, so is S. { 6 to $69\frac{6}{10}$ W.ing; 2 to $28\frac{7}{10}$ N.ing }

Course

	Courses.	Dist.	Diff. Lat. North	Diff. Lat. South	Departure. East	Departure. West	
1.	S.E. by S.	68		56.5	37.8		
2.	S.W. by W.	55		30.6		45.7	
3.	W.N.W.	75	28.7			69.3	
			28.7	87.1	37.8	115.0	
				28.7		37 8	
			Diff. Lat.	58.4		77.2	Dep

3. Then; as Min. 58.4 is to Min. 77.2, so is T. 45d. to T. 52d. 54m. the Course from the South towards the West, that is, S. W. three quarters W. almost; And again,
As S. 52d. 54m. is to min. 77.2. so is S. 90d. to 96.8 Minutes, the Distance from the first Place of Departure.

	D. M.	
Latitude sailed from ————————	40 : 00	North ;
The Diff. of Latitude min. 58.4 or	00 : 58	Southerly ;
Substracted, gives the Lat. the Ship is in	39 : 02	North ;
Therefore the middle Latitude is	39 : 31	
Substracted from————————	90 : 00	
Gives the Comp. of the middle Lat.	50 : 29	

4. As S. 50d. 29m. is to Min. 77.2, so is S. 90d. to 101.1m. the Difference of Longitude.

	D. M.	
The Longitude sailed from is ——	05 : 14	West.
The Difference of Longitude ——	01 : 41	West.
Added, gives the Longit. the Ship is in	06 : 55	West.

Exaample 2. A Ship in 41d. 30m. North Latitude, and 10d. 20m. East Longitude, sails these several Courses and Distances, viz. S. E. by S. 52 Minutes, then S.S.W. 63 min.

63 Minutes, E. by N. 47 Minutes, N. by E. half E. 35 Minutes, NNW. a quarter W. 47 Min. WNW. 73 Min. I demand the Courſe and Diſtance from the firſt Place of Departure, alſo the Latitude and Longitude the Ship is in?

1. For the doing of which, obſerve the following Work.

		M.		Points.		M.
1	Courſe, as S. 8 Pts. is to	52	ſo is S.	3 / 5	to	28.9E. / 43.2S.
2		63		2 / 6		24.1W. / 58.2S.
3		47		7 / 1		46.1E. / 9.2N.
4		35		1½ / 6½		10.2E. / 33.5N.
5		47		2¼ / 5¾		20.1W. / 42.5N.
6		73		6 / 2		67.4W. / 27.9N.

2. Then, to collect the ſeveral Northings, Southings, Eaſtings, and Weſtings into one, ſee the following Table; whereby you have the Difference of Latitude and Departure from the Meridian.

Courſes.		Diſt.	Diff. Lat. North	Diff. Lat. South	Departure Eaſt	Departure Weſt
1.	S. E. by S.	52		43.2	28.9	
2.	S. S. W.	63		58.2		24.1
3.	Eaſt by North	47	9.2		46.1	
4.	N. by E. ½ E.	35	33.5		10.2	
5.	N. N. W. ¼ W.	47	42.5			20.1
6.	W. N.W.	73	27.9			67.4
			113.1	101.4	85.2	111.6
			101.4			85.2
Difference Latitude			11.7	Departure		26.4

3. Now

Now, having the Difference of Latitude and Departure from the Meridian known, the direct Courſe and Diſtance is thus found.

As 11.7 Minutes is to 26.4 Minutes, ſo is T. 45d. to T. 66d. 06m. the Courſe North Weſterly, or W. N. W. becauſe the North and Weſt Columns are the greateſt.

Here obſerve the Courſe is more than 45 Degrees from the Meridian, becauſe the Departure is more than the Difference of Latitude, according to the Note in the 6th Caſe of Plane Sailing, in Page 214. Then for the Diſtance, ſay,

As S. 66d. 06m. is to 26.4 Minutes, ſo is 90 Degrees to Minutes 28.88, the Diſtance from the firſt Place of departing.

	D.	M.	
Latitude ſailed from - - - - - - -	41	30	
The Difference of Latitude m. 11.7. or	00	12	North
Added, gives the Lat. the Ship is in -	41	42	North
And the middle Latitude is - - - - -	41	36	
Subtracted from - - - - - - - - -	90	00	
Gives the Comp. of the Middle Latitude	48	24	

Then to find the Difference of Longitude, ſay,

As S. 48d. 24m. is to 26.4 m. ſo is S. 90d. to 35.31 min. the Difference of Longitude.

	D.	M.	
The Longitude ſailed from is - - -	10	20	Eaſt
The Difference of Longitude 35.31 min. or	00	35	Weſt
Subtract, it gives the Long. the Ship is in	09	45	Eaſt

Secondly,

Secondly, The Use of Gunter's Scale *in* Mercator's Sailing.

CASE I.

The Latitude and Longitude of two Places being given, to find the Course and Distance between them.

Example. I demand the Course and Distance from the *Lizard* to *Barbadoes?* Latitudes and Longitudes of those Places being supposed as follows:

		d.	m.			d.	m.	
Lizard	Lat.	49	57	North	Long.	5	14	W.
Barbadoes		12	58	North		58	50	W.

The Diff. of Lat. 36 59 South, Diff. Long. 53 36 W.
60 60

Minutes 2219 Minutes 3216

To answer the Question, the Proportions are these.

1. As the Meridional Difference of Latitude, is to the Difference of Longitude, so is Radius to the Tangent of the Course.

2. As the Sine Complement of the Course is to the Difference of Latitude, so is Radius to the Distance of the two Places.

The Meridional Difference of Latitude is thus found: Extend the Compasses on the Meridional Line, from one Latitude to the other; that Extent measured on the Equinoctial Line (the next Line adjoining to the Meridional Line marked EP.) gives the Meridional Difference of Latitude.

Thus the Extent from Latitude 49d. 57m. to Latitude 12d. 58m. on the first, being measured on the latter, is deg. 44 $\frac{75}{100}$ or 44d. 45m. or 2685 Minutes, the Meridional Difference of Latitude; Then say,

As

As 2685 M. is to 3216 M.
Or, As 44d. $\frac{75}{100}$ is to 53d. $\frac{9}{10}$ } ſo is T. 45d. to T. 50d. 09m. the Courſe from the South Weſtward, or S. W. 5 Degrees 9 Minutes Weſterly: And again,

As S. 39d. 51m. is to 2219m. ſo is S. 90d. to 3463m. Or, as S 39d. 51m. is to 36d. $\frac{983}{1000}$, ſo is Sine 90d. to 57d. $\frac{71}{100}$ or 57d. 43m. equal to 3463 Minutes.

CASE II.

Both Latitude and Courſe being given; to find the Diſtance and Difference and Longitude.

The Proportions are theſe:

1. AS the Sine Complement of the Courſe is to the Difference of Latitude, *&c.* as before in the Second Caſe of Plane-Sailing, to find the Diſtance and Departure from the Meridian, in Page 210.

2. As the Sine Complement of the middle Latitude is to the Departure from the Meridian, ſo is the Radius to the Difference of Longitude.

Or thus; as the Sine Complement of the Courſe is to the Meridional Difference of Latitude, ſo is the Sine of the Courſe to the Difference of Longitude.

Example. Admit from the *Lizard* in 49 Deg. 57 Min. North Latitude, and Longitude 5d. 14m. Weſt, we made (when Leeway, Variation, *&c.* were allowed for) our Courſe to be South 39 Deg. Weſterly; and then by Obſervation was in 44d. 58m. North Latitude; I demand her Diſtance run, and what Longitude ſhe is in.

Latitude ſailed from ———— 49d. : 57m. North
Latitude by Obſervation ———— 44d. : 58m. North

Subſtracted, is the Diff. of Lat.—— 04d. : 59m. Southerly
60

Minutes 299

The Middle Latitude is ———— 47d. : 27m.
Subſtract from ———— 90d. : 00m.

Comp. of the Middle Latitude —— 42d. : 33m.

1. As S. 51d. is to 299m. ſo is S. $\left\{ \begin{matrix} 90 \\ 39 \end{matrix} \right\}$ d. to $\left\{ \begin{matrix} 385 \text{ Diſt.} \\ 242 \text{ Depart} \end{matrix} \right.$

2. As 42d. 33m. is to 242 Minutes, ſo S. 90d. to 358 Minutes, the Difference of Longitude. Or thus, the Exten from 49d. 57m. on the Meridian Line, 44d. 58 m. meaſured on the Line of equal Parts is 7d. $\frac{4}{10}$ or 7d. 24m. or 444 Minutes, for the Meridional Difference of Latitude: Then,

As 51d. is to 444 Minutes, ſo is S. 39d. to 358m. Or thus;

As 299 Minutes is to 242 Minutes, ſo is 444 Minutes to 358 Minutes, as before; which is the Difference of Longitude.

	d. m.
The Longitude ſailed from ————	05 : 14 Weſt
The Difference of Longitude 358 min. or —	05 : 58 Weſt
Added, gives the Longitude the Ship is in	11 : 12 Weſt

CASE III.

Both Latitudes and Diſtance run being given, to find the Courſe and Difference of Longitude.

To perform this, the Proportions are theſe:

1. AS the Diſtance ſailed is to Radius, ſo is the Difference of Latitude to the Sine Complement of the Courſe, as in the fourth Caſe of Plane Sailing, in Page 211, by which Caſe alſo you may find the Departure from the Meridian, or Meridian Diſtance.

2. A

2. As the Sine Complement of the middle Latitude is to the Departure, ſo is the Radius to the Difference of Longitude: Or thus;

As the Difference of Latitude is to the Departure from the Meridian, ſo is the Meridional Difference of Latitude to the Difference of Longitude.

Example. A Ship in 46d. South Latitude, and 1d. 15m. Weſt Longitude, ſails 100 Leagues North Eaſtward, and then by Obſervation is in Latitude 42d. South: I demand her Courſe, Departure from the Meridian, and the Longitude ſhe is in?

Latitude ſailed from is - - - 46d. South
Latitude by Obſervation is - - 42d. South

Subſtracted, gives the Diff. of Lat. 4d. or 80 Leagues N.

The middle Latitude is - - - 44d. whoſe Comp. is 46d.

1. As 100 Leagues is to S. 90d. ſo is 80 Leagues to S. 53 Deg. 15 Min. the Complement of the Courſe; ſo that the Courſe is 36 Deg. 45 Min. North Eaſtward, or N.E. by N. a Quarter E. And then again,

As S. 90d. is to 100 Leagues, ſo is S. 36d. 45m. to 60 Leagues, the Departure from the Meridian.

As S. 46 Deg. is to 60 Leagues, ſo is S. 90 Deg. to 83 Leag. the Difference of Longitude: Or thus: The Extent from 46d. to 42d. on the Meridional Line makes 5d. $\frac{5}{10}$, or 110 Leagues on the equal Parts, which is the Meridional Diff. of Latitude; and then it is,

As 80 leag. is to 60 leag. ſo is 110 leag. to 83 leag. } diff. long.
Or, as 4d. is to 3d. ſo is 5d. $\frac{5}{10}$ to 4d. $\frac{11}{100}$ } diff. long.
Longitude ſailed from is - - - - 1d. : 15m. Weſt
The Difference of Longitude 83 leag. or 4d. : 09m. Eaſt

Subſtracted gives the Long. the Ship is in 2d. : 54m Eaſt

CASE

CASE IV.

Both Latitudes and Departure from the Meridian being given, to find the Course, Distance run, and Differ. Long.

1. THE Course and Distance run is found by the sixth Case of Plane Sailing in Page 213.

2. The Difference of Longitude is found as in the second, third, or fourth Case in *Mercator*.

Example. A Ship in 33 Degrees North Latitude, and 178 Degrees West Longitude, sails South Westward until she has departed from the Meridian 58 Leagues, and then she is in Latitude 28d. 36m. North. I demand her Course, Distance run, and what Longitude she is in?

	d. m.
Latitude sailed from ——	33 : 00 North
Latitude the Ship is in ——	28 : 36 North
The Difference of Latitude	04 : 24 or 88 Leagues

The Middle Latitude is—30 : 48 Comp. 59d. 12m.

1. As 88 Leagues is to 58 Leagues, so is T. 45 Deg.—to T. 33d. 20m. which is the Course South Westerly, or or SW. by S.

2. As S 33d. 20m. is to 58 Leagues, so is S. 90d. to 105 Leagues, the Distance sailed.

3. The Meridional Difference of Latitude 5 Deg. $\frac{15}{100}$ or 5 Deg. 9 Min. or 103 Leagues is found as before directed.

4. As { S. 59. 12m. / 88 Leag. } is to 58 Leag. so is { S. 90 Deg. / 103 Leag. } to 67 Leagues the Difference of Longitude.

5. Longitude sailed from - - - 178 : 00 West
The Difference of Longitude 67 Leag. or 03 : 21 West

Added, the Sum is ——	181 : 21
Which substract from ——	360 : 00
Remainder is the Longitude the Ship is in	178 : 39

CASE

CASE V.

One Latitude, Courſe and Diſtance run being given, to find the other Latitude, and Difference of Longitude.

1. THE Difference of Latitude and Departure from the Meridian is found by the firſt Caſe of Plane Sailing (in Pages 208 and 209) and conſequently the other Latitude.

2. The Difference of Longitude is found as before in the ſecond or third Caſe of *Mercator.*

Example. If a Ship ſails SE. by S. 120 Leagues from a Port in 53d. 30m. North Latitude, and 2d. 15m. Weſt Longitude, what Latitude and Longitude is ſhe in?

As S. 8 Points is to 120 Leagues, ſo is S. 5 Points to 100 Leagues, the Difference of Latitude.

And as S. 8 Points is to 120 Leagues, ſo is S. 3 Points to 67 Leagues the Departure from the Meridian.

	D. M.
Latitude ſailed from————————	53 : 30 North
The Diff. of Latitude 100 Leagues, or ——	05 : 00 South
Subſtracted, gives the Lat. the Ship is in—	48 : 30 North

And the Middle Latitude is——— ——— 51 Comp. 39d.
The Meridional Diff. Lat. is 8d. or 160 Leagues.

As { S. 39d. / 100 Leagues } is to 67 Leag. ſo is { S. 90d. / 160 Leagues } to 107 Leagues the Difference of Longitude.

	D. M.
Longitude ſailed from is ————————	02 : 15 Weſt
The Diff. of Longitude 107 Leagues, or —	05 : 21 Eaſt
Subſtracted, gives the Longitude ſhe is in —	03 : 06 Eaſt

So that the Ship hath croſſed the firſt Meridian.

CASE

CASE VI.

Sailing in a Parallel, to find the Difference of Longitude.

To do this, the Proportion is thus;

AS the Sine Complement of the (Parallel or) Latitude is to the Distance sailed East or West, so is Radius to the Difference of Longitude.

Example. If a Ship sails West 390 Minutes, in the Latitude of 50d. 10m. and departs from 2d. 45m. East Longitude, I demand what Longitude the Ship is now in?

As S. 39d. 50m. is to 390m. so is 90d. to 610m. the Difference of Longitude.

	d.	m.	
Longitude sailed from, is — — —	2 :	45	East
The Difference of Longit. 610 min, or —	10 :	10	West
Substracted, gives the Long. the Ship is in —	7 :	25	West

CASE VII.

The Diff. of Longitude of two Places in one Parallel or Latitude being given, to find their Distance in that Parallel.

THE Proportion is thus; as Radius is to the Difference of Longitude, so is the Sine Complement of the Latitude to the Distance in that Parallel.

Example 1. Suppose Cape *St. Vincent* in *Portugal* and Cape *Henry* in *Virginia*, both in 37 Deg. North Latitude, and their Longitude as hereunder, what is their Distance in that Parallel?

Cape St. *Vincent*	Longitude	09 : 06 West.
Cape *Henry*		76 : 23 West.

Substracted, gives the Diff. Long. 67 : 17 or 4037 Minutes
Latitude of both Places is nearly — — 37 Deg. North
Substract from — — — — 90

Remains Complement of the Latitude — 53

2. As S. 90 Degrees is to S. 53 Degrees, ſo is 67 $\frac{3}{10}$ equal to 67d. 17m. to 53 $\frac{73}{100}$ or 53^{d}. 44^{m}. or 3224m. the Diſtance required. Or thus,

2. As 90 Degrees is to S. 53 Degrees, ſo is 4037 Minutes to 3224m. the Diſtance in the Parallel, as above.

Example 2. Suppoſe two Ships under the Equinoctial, 100 Leagues aſunder, and each ſails North till both come into Latitude 60 Degrees, how far are they now aſunder? *Anſwer*, 50 Leagues. For,

As S. 90 Degrees is to S. 30 Degrees, ſo is 100 Leagues to 50 Leagues, the Diſtance required.

CASE VIII.

To find how many Minutes or Miles make a Degree of Longitude in any Parallel of Latitude.

The RULE.

AS Radius is to the Sine Complement of the Latitude, ſo is 60 Min. (a Degree on the Equinoctial) to the Minutes making a Degree of Longitude in the Parallel deſired.

Example. In the Latitude of 50 Degrees, I demand how many Minutes of Eaſting and Weſting make a Degree of Longitude? *Anſwer*, 38 $\frac{1}{2}$ Minutes. For,

As S. 90 Deg. is to S. 40 Deg. ſo is 60 Min. to Min. 38.5 or 38 and a half, making one Degree of Longitude in Latitude 50 Degrees.

This may be done by the Plane-Scale thus:

Take the given Latitude from the Chords, and meaſure it on the Line M.L. (which is Miles of Longitude) and it will anſwer your Deſire: As, for Inſtance, take 50 Degrees from the Chords, and meaſure it on the Scale M. L. and it ſheweth 38 Min. and a half, the ſame as before.

VI. *The*

VI. *The Use of* Gunter's Scale *in Astronomy.*

PROBLEM I. *The Sun's Place in the Ecliptic, and his greatest Declination being given, to find his Right Ascension and present Declination.*

To perform this, observe the following Proportions:

1. AS Radius is to the Sine Complement of the Sun's greatest Declination, so is the Tangent of the Longitude (from the nearest Equinoctial Point) to the Tangent of his Right Ascension from the said Point.

The Names and Characters of the 12 *Signs.*

North Signs		South Signs	
♈	*Aries*	♎	*Libra*
♉	*Taurus*	♏	*Scorpio*
♊	*Gemini*	♐	*Sagittarius*
♋	*Cancer*	♑	*Capricornus*
♌	*Leo*	♒	*Aquarius*
♍	*Virgo*	♓	*Pisces*

Note 1. The Sun's greatest Declination is 23 Degrees 29 Minutes.

Note 2. The Beginning of *Aries* and *Libra* are the two Equinoctial Points.

Note 3. This Proportion (above) finds the Sun's Right Ascension only when he is in the first Quarter of the Ecliptic, that is, ♈, ♉, ♊. But when he is in the second Quarter, ♋, ♌, ♍, subtract from 180 Deg. and when in ♎, ♏, and ♐, add to it 180 Degrees, and in the last Quarter ♑, ♒, and ♓, subtract what is found by this Operation, from 360 Degrees, and you have the Sun's Right Ascension from ♈, for any Place in the Ecliptic desired.

2. As Radius is to the Sine of the Sun's Longitude from the nearest Equinoctial Point, so is the Sine of the Sun's greatest Declination to the Sine of his present Declination.

Note, The Sun being in ♈, ♉, ♊, ♋, ♌, and ♍, his Declination is North, but in ♎, ♏, ♐, ♑, ♒, and ♓, it is South.

Example.

When the Sun's Place in the Ecliptic is ♉ 24d 15m *What is his Right Ascension and Declination?*

The Sun being in ♉ 24 Degrees 15 Minutes, his Longitude from the nearest Equinoctial Point (being now the beginning of ♈) is 54 Degrees 15 Minutes, and the Complement of his greatest Declination is always 66 Degrees 31 Minutes. Then it follows:

1. As S. 90 Degrees is to S. 66 Degrees 31 Minutes, so is Tangent 54 Degrees 15 Minutes, to Tangent 51 Degrees 52 Minutes, the Sun's Right Ascension (from the Beginning of ♈) required.

1. By *Gunter* with Compasses.

The Extent from Sine 90 Degrees, to Sine 66 Degrees 31 Minutes will reach from Tangent 54 Degrees, 15 Min. to Tangent 51 Degrees 52 Min. the Sun's Right Ascension.

By the *Sliding Gunter.*

1. Let the middle Piece be so put in, that Sines may slide against Sines, and Tangents against Tangents.

2. Then bring 90 Degrees in Sines (on the outside Piece) against 66 Degrees 31 Minutes in Sines (on the middle Piece) then against 54 Degrees 15 Min. in Tangents (on the middle Piece) is 51 Deg. 52 Min. in Tangents (on the outside Piece) the Right Ascension as above.

This Proportion being to be wrought on Sines and Tangents, jointly, I thought it necessary to express the Manner of its Operation on both Sorts of *Gunters*, that the Learner might see how it agrees with the General Rule given at the Beginning of this Discourse of the *Gunter* in Pages 177 and 178, but shall wave it in the rest, and only write the Proportion in Words and Figures, according to the particular Example as follows, for the Sun's Declination.

1. As

2. As S. 90 Degrees is to S. 54 Deg. 15 Min. ſo is S. 23 Deg. 29 Min. to S. 18 Deg. 52 Min. the Sun's Declination North, increaſing.

PROBLEM II.

The Latitude of a Place, and the Sun's Declination being given, to find his Amplitude and Aſcenſional Difference, and conſequently his Riſing and Setting, and the Length of the Day and Night.

To perform this Problem, the Proportions are theſe:

1. AS the Sine Complement of the Latitude is to Radius, ſo is the Sine of the Sun's Declination to the Sine of his Amplitude.

Note, The Amplitude and Declination are always of one Kind; that is, both North, or both South.

2. As the Tangent Complement of the Latitude is to the Tangent of the Sun's Declination, ſo is Radius to the Sine of his Aſcentional Difference.

Note 1. The Aſcenſional Difference (being reduced into Time, by allowing 15 Degrees for one Hour, and then) added to, and ſubſtracted from 6 Hours, the one is Sun-riſing, and the other Sun-ſetting.

Note 2. If the Latitude and Declination are both North or both South, the Sun riſeth before, and ſets after Six of the Clock; but if one be North, and the other South, the contrary.

Note 3. If the Sun's riſing and ſetting be doubled ſeverally, the former is the Length of the Night, and the latter is the Length of the Day.

Note 4. By this Problem the Tables of Amplitudes and Semidiurnal Arches, *&c.* in this Book were calculated.

Example. The Latitude being 51 Deg. 32 min. North, Sun's Declination 23 Deg. 29 Min. North, I demand his Amplitude and Aſcenſional Difference; alſo his Riſing, Setting, and Length of the Day and Night.

	d. m.		d. m.
Answ. Sun's Amplitude is	39 : 50	Ascen. Diff.	33 : 10
Sun-setting } is Hours	8 : 13	Leng. of Day	16 : 26
Sun-rising } is Hours	3 : 47	Leng. of Night	7 : 34

For (by the preceding Proportions,)

1. As S. 38d. 28m. is to S. 90d. so is S. 23 deg. 29 min. to 39 deg. 50 min. the Amplitude North, because the Declination is North, that is, the Sun riseth East 39 deg. 50 min. Northerly, and setteth West 39d. 50m. Northerly.

2. As T. 38 Deg. 28 Min. is to T. 23 Deg. 29 Min. so is S. 90 Deg. to S. 33 Deg. 10 Min. the Ascensional Difference, which being reduced into Time, is 2 Hours 13 Minutes, and added to 6 Hours, is 8 Hours 13 Minutes for Sun-setting; which doubled is 16 Degrees, 26 Minutes the Length of the Day.

Again, 2 Hours 13 Minutes substracted from 6 Hours, is 3 Hours 47 Minutes for Sun-rising; which doubled is 7 Hours 34 Min. the Length of the Night.

PROBLEM III.

The Latitude of a Place, and the Sun's Declination being given, to find his Altitude and Azimuth at Six of the Clock.

To solve this, say,

1. AS Radius is to the Sine of the Latitude, so is the Sine of the Sun's Declination to the Sine of his Altitude at Six of the Clock.

2. As Radius is to the Sine Complement of the Latitude, so is the Tangent of the Sun's Declination to the Tangent of his Azimuth (from the East or West) at Six of the Clock.

Note, The Azimuth is from the East at Six in the Morning, and from the West at Six in the Afternoon, Northerly, in North Latitude, but Southerly in South Latitude.

Example, In 51d. 32m. North Latitude, the Sun's Declination being 23d. 29m. North, what is his Altitude and Azimuth at Six of the Clock.

Answer,

Anſwer, His Altitude is 18d. 11m. and his Azimuth Eaſt 15d. 7m. Northerly, or 74d. 53m. North Eaſterly; or Weſterly; For,

1. As 90d. is to S. 51d. 32m. ſo is S. 23d. 29m. to S. 18d. 11m. the Altitude at Six of the Clock.

2. As S. 90d. is to S. 38d. 28m. ſo is T. 23d. 29m. to T. 15d. 07m. the Azimuth at Six; that is, 74d. 53m. North Eaſterly at Six in the Morning, but North Weſterly in the Afternoon, (as by the preceding Proportions.)

PROBLEM IV.

The Latitude of a Place and Sun's Declination being given, to find his Altitude, and the Hour of the Day, when he is in Eaſt or Weſt.

To perform this, the Proportions are theſe;

1. AS the Sine of the Latitude is to Radius, ſo is the Sine of the Sun's Declination to the Sine of its Altitude, when Eaſt or Weſt.

2. As the Tangent of the Latitude is to the Tangent of the Sun's Declination, ſo is Radius to the Sine of the Hour from Six of the Clock when he is Eaſt or Weſt.

Note 1. The Sun is Eaſt after Six in the Morning, but Weſt before Six in the Afternoon.

Note 2. The Hour found (by the laſt Proportion) being reduced into Time (by allowing 15 Deg. to an Hour) and added to, or ſubtracted from 6, gives the Hour of the Day, when the Sun is Eaſt or Weſt.

Example. In 51d. 32m. North Latitude, the Sun's Declination being 23d. 29m. North, what is his Altitude, and what Time of the Day is it when he is in Eaſt or Weſt?

Anſwer, His Altitude is 30d. 35m. and the Hour of the Day is { 7h. 21 Min. Morning, when Eaſt.
4h. 39m. Afternoon, when Weſt.

For (by the preceding Proportions)

1. As S. 51d. 32 m. is to S. 90d. ſo is S. 23d. 29m. to S. 30d. 55m. the Sun's Altitude when either Eaſt or Weſt.

2. As T. 51d. 32m. is to T. 23d. 29m. so is S. 90d. to S. 20d. 11m. the Hour from Six; which makes 1 Hour 21 Minutes, and added to 6, is 7h. 21m. but subtracted from 6, is 4h. 39m. the former is the Time when the Sun is East in the Morning, and the latter the Time when he is West in the Afternoon.

PROBLEM V.

Supposing the Sun to be in the Equator or Equinoctial (that is, to have no Declination) and the Latitude of a Place, and the Sun's Altitude to be given, to find his Azimuth, and the Hour of the Day.

This PROBLEM is thus performed;

1. AS the Tangent Complement of the Latitude is to the Tangent of the Sun's Altitude, so is Radius to the Sine Complement of his Azimuth from the South in North Latitude, but from the North in South Latitude: Easterly in the Forenoon; and Westerly in the Afternoon.

2. As the Sine Complement of the Latitude is to Radius, so is the Sine of the Sun's Altitude to the Sine Complement of the Hour from Noon.

Example. In 51d. 32m. North Latitude, the Sun having no Declination, and his Alt. being 21d. 50m. in the Forenoon, I demand his Azimuth and the Hour of the Day?

Answ. His Azimuth is South 59d. 45m. Easterly, that is, the Sun is upon the S. E. by E. a quarter E. Point of the Compass, and the Hour of the Day is Hours 8.27 Minutes Morning. For (by the above Proportions)

1. As T. 38d. 28m. is to T. 21d. 50m. so is S. 90d. to S. 30d. 15m. whose Complement is 59d. 45m. is the Sun's Azimuth required.

2. As S. 38 Deg. 28 Min. is to S. 90 Deg. so is S. 21 Deg. 50 Min. to S. 36 Deg. 50 Min. whose Complement is 53 Deg. 10 Min. or 3 Hours 33 Minutes, which sub-

tracted

tracted from 12, gives 8 Hours 27 Minutes, or 27 Min. after 8 of the Clock in the Morning, the Time of the Day required.

PROBLEM VI.

The Latitude of a Place, the Sun's Declination and his Altitude being given, to find his Azimuth, and the Hour of the Day.

The Performance of this is as follows;

1. TAKE the Complement of the Latitude, the Complement of the Sun's Altitude, and the Sun's Distance from the Pole (which is his Declination added to 90 Deg. when the Latitude and Declination, are one North and the other South, but both being North or South it is the Complement of the Declination, and add them together into one Sum.

2. From half that Sum subtract (to find the Sun's Azimuth) the Sun's Distance from the Pole, but (to find the Hour) subtract the Complement of his Altitude, and note the Remainder.

3. To find the Azimuth, you have these two Proportions following.

First, As Radius is to the Sine Complement of the Latitude, so is the Sine Complement of the Altitude to a fourth Sine. Then again,

Secondly, As that fourth Sine is to the Sine of the half Sum, so is the Sine of the Remainder to a fifth Sine; against which on the Line of versed Sines is the Sun's Azimuth from the North in North Latitude, but from the South in South Latitude.

4. To find the Hour, these are the two Proportions which follow;

First, As Radius is to the Sine Complement of the Latitude, so is the Sine of the Sun's Distance from the Pole to a fourth Sine.

Secondly,

Secondly, As that fourth Sine is to the Sine of the half Sum, ſo is the Sine of the Remainder to a fifth Sine; againſt which on the verſed Sines, is the Hour of the Day from Noon.

Example. In 51 Deg. 30 Min. North Latitude, the Sun's Declination being 15 Deg. 10 Min. North, and his Altitude obſerved to be 11 Deg. 30 Min. I demand his Azimuth and Hour of the Day?

	d.	m.		d. m.		d. m.
	90	00		90.00		90.00
Latitude	51	30	North Declinat.	15.10	Nor. Alt.	11.30
Comp. Lat.	38	30	Sun's diſt. from Pole	74.50	Com. Alt.	78.30
Comp. Alt.	78	30	Comp. Latitude	38.30		
Sun's Diſt.	74	50	Comp. Altitude	78.30		
Sum is	191	50	Sum is ———	191.50		
half Sum is	95	55	The half Sum is	95.55		
Remainder	21	05	Remainder is —	17.25		

Then to find the Azimuth ſay;

1. As S. 90d. is to S. 38d. 30m. ſo is Sine 78d. 30m. to Sine 37d. 20m. the fourth Sine.

2. As S. 37d. 20m. is to S. 95d. 55m. ſo is Sine 21d. 5m. to S. 36d. againſt which, on Verſed Sines is 80d. the Sun's Azimuth from the North Eaſterly, if in the Forenoon, but North Weſterly in the Afternoon.

And to find the Hour of the Day, it is thus;

1. As Sine 90d. is to Sine 38d. 30m. ſo is Sine 74d. 50m. to Sine 37d. the fourth Sine.

2. As Sine 37d. is to Sine 95d. 55m. ſo is Sine 17d. 25m. to Sine 29d. 40m. againſt which on the verſed Sines, is 90d. 30m. or 6 Hours 2 Minutes, which is the Hour from Noon; that is 58 Minutes after Five of the Clock in the Morning, or two Minutes after Six in the Afternoon.

THE

THE

Description and Use of the

SECTOR.

1. THIS useful Inſtrument may be of any Length, but it is commonly made one Foot ſix Inches, or two Feet long, to open with a Joint in the Middle like a Carpenter's Rule, and one Inch and a Half or more in Breadth, and of any Thickneſs at Pleaſure, according to the Matter it is made of, which may be either Box-wood, Ivory, Braſs, or Silver.

2. There are two Sorts of Sectors, known by the Names of *Gunter*'s and *Forſter*'s Sector, and ſometimes both put on one Inſtrument, that is *Gunter*'s Sector put on one Side of it, and *Foſter's* on the other.

3. The Lines on *Gunter*'s Sector are theſe, The *Line of Lines* (marked at the End with L) *Lines of Sines* (marked S) *Superficies* (marked Sup.) *Solids*, (marked Sol.) Line of *Metals*, Line of *Equated Bodies*, Line of *Inſcribed Bodies*, &c.

4. The Lines on *Forſter*'s Sector are theſe Five, *viz.* The *Line of Lines*, or *Equal Parts*, *Chords*, *Sines*, *Tangents*, and *Secants*, each marked at the End with its Name, or firſt Letter of its Name.

5. All *Sector-Lines* or *Scales*, meet at the Center of the Head (where the Joint is) on the Left-hand, and from thence are figured towards the Right, each being twice repeated; that is, one on each Leg or Side of the *Sector*, anſwering one another.

The *Sector* is uſeful in Projection to reduce or to make a Scheme to any poſſible Magnitude: Alſo in Proportion, to work any ſtated Canon or Proportion in *Arithmetic*, *Geometry*, *Trigonometry*, *Navigation*, *Aſtronomy*, &c. of which I will give a brief Account, yet ſo as the Learner may be informed now to employ them further.

1. *The*

I. *The Use of the* Sector Lines *for Projection.*

IN Projection it is often required to enlarge or diminish the Scale, that the Draught designed may be of its desired Magnitude; in doing of which are used Lateral and Parallel Distances, or Extents of the Compasses; and to avoid a needless Repetition of the same Things, take once for all what is meant by a Lateral, and Parallel Distance, or Extent of the Compasses.

1. As *Lateral Distance* (in any Line or Scale) is the Extent or Distance taken on the same Line, on the same Side or Leg of the Sector from the Beginning thereof, to any Number therein desired.

As for Example; the Lateral Sine of 30 Degrees is the Distance of 30 from the beginning of the Line of Sines; and so it is in the Line of equal Parts, Chords, Tangents, Secants, &c.

2. A *Parallel Distance* (in any Line or Scale on the Sector) is the Extent or Distance, taken across from any Number in any Line on one Leg of the Sector to the like Number in the like Line on the other Leg of the Sector.

Or the nearest Distance from any Number on one Leg (taken across) to the like Number of the Line on the other Leg of the Sector.

As for Example: The Parallel Sine of 30 Degrees is (supposing the Sector opened to any Angle) the Distance from 30 in the Line of Sines on one Leg of the Sector, to 30 deg. in the Line of Sines on the other Leg.

Or, the nearest Distance from 30 in the Line of Sines on one Leg, to 30 in the Lines of Sines (that is to say) the Line issuing from the Center of the (Joint or Head) on the other Leg, is the Parallel Sine of 30 Degrees. In like Manner it is done in any other Line or Scale.

This being understood, the enlarging or diminishing any of the Sines, or the finding a Chord, Sine, Tangent, or Secant, to any proposed Radius, will not be difficult; and

and for the Learner's further Information take this General Rule.

I. *To find the Chord, Sine, Tangent, and Secant,* &c. *to any Radius (greater or less) proposed.*

The General RULE is thus;

1. Take the proposed Radius in the Compasses, and make it a Parallel on the Sector in the Radius of any one Line, that is, open the Sector till the proposed Radius in the Compasses, be a Parallel Chord of 60 Degrees in the Line of Chords; or a Parallel Sine of 90 Degrees in the Line of Sines; or a Parallel Tangent of 45 Degrees in the Line of Tangents; or a Parallel Secant of 0 Degrees in the Line of Secants; for the Chord of 60, Sine of 90, Tangent of 45, and Secant of 0 Degrees are equal, and each equal to Radius.

2. The Sector being kept at that opened Distance, or Angle, the Parallel Distance in any Line will be a Lateral Distance on a like Line to the proposed Radius, that is, a Parallel Chord of 10, 20, 30, *&c.* is the Chord of 10, 20, 30, *&c.* to the proposed Radius; also a Parallel Sine, Tangent and Secant of 20, 30, 40, *&c.* is the Sine Tangent and Secant of 20, 30, 40, *&c.* to the aforesaid Radius.

II. *The Use of the* Sector *in working Proportions.*

SUpposing the Learner understands how to take a Lateral Distance on the Line of Lines (otherwise called Equal Parts) on the Chords, Sines, *&c.* and to apply them parallel in any Time on the Sector, the working of a Proportion is thus;

A General Rule to work by the Sector.

1. Take the Second Term Lateral (that is, from the Beginning of the Line to the proposed second Term) and opening the Sector, apply that Extent Parallel (that

is,

is acroſs) in the firſt Term; then ſtay the Sector at this Parallel Extent.

2. Take the Parallel Diſtance of the third Term, and meaſure it Laterally, and it gives the fourth Term ſought or required.

Or briefer thus: As the Lateral ſecond Term is to the Parallel firſt Term; ſo is the Parallel third Term to the Lateral fourth Term.

This one Rule is ſufficient for any Proportion whatever, and will appear ſo by a few Examples.

PROB. I. *To multiply by the Line of Lines on the* Sector.

The Proportion is,

AS 1 is to the Multiplier, ſo is the Multiplicand to the Product.

Example. What is the Product of 8 multiplied by 4?

The Analogy, or Proportion is this;

As 1 is to 4, ſo is 8 to the Product 32, thus found by the Sector, and general Rule aforeſaid.

1. On the Line of Lines, (that is the Line of Equal Parts) take the ſecond Term 4 Lateral, that is, from the Center of the Joint, and the Beginning of the Line to 4 in the ſame Line.

2. Open the Sector till you fit the (aforeſaid Lateral) Diſtance in the Compaſſes in the Parallel of 1 and 1, or 10 and 10, that is, ſet it over from 10 to 10 at the End of the ſame Line, and now being counted for 1 and 1, the firſt Term keep the Sector juſt at that Angle or Opening.

3. The Parallel Diſtance of the third Term 8; that is, from 8 to 8 taken acroſs from one Leg to the other in the ſaid Line of Lines, and meaſured Laterally (that is, from the Beginning of the Line towards the End) reacheth to 32 the fourth Term, which is the Product of 8 multiplied by 4. Or ſhorter thus:

As

As the second Term 4 (Laterally taken) is to the first Term 11 (parallely set) so is the third Term (taken Parallel) 8, to the fourth Term (measured Literally) which is 32, the Product as above. Or thus, As the Lateral 8, is to the Parallel 11, counted for 1, so is the Parallel 4, to the Lateral 32, as above.

PROBLEM II.

To divide by the Line of Lines on the Sector.

The Analogy, or Proportion, is thus:

AS the Divisor is to 1, so is the Dividend to the Quotient. Or thus;

As the Divisor is to the Dividend, so is 1 to the Quotient.

Example 1. How many Square Yards are in 36 Square Feet? *Answer*, 4 Square Yards. For (by the above Proportions,)

As 9 is to 1, so is 36 to the Quotient 4: Thus to be wrought by the Sector; As Lateral 1 is to Parallel 9, so is Parallel 36 to Lateral 4, the Yards required.

PROBLEM III.

To work the Rule of Three by the Line of Lines on the Sector; *or unto three Numbers given, to find a fourth in Geometric Proportion.*

The Analogy is,

AS the first Term is to the second Term, so is the third Term to the fourth required.

Example 1. If the Diameter of a Circle be 14 Inches, what is the Circumference? *Answer* 44 Inches, For, by the Proportion is thus;

As 7 is to 22, so is the Diameter 14 to 44 the Circumference required; by the Sector thus wrought, as Lateral 22, is to Parallel 7, so is Parallel 14, to Lateral 44, the Circumference of a Circle whose Diameter is 14.

Example

Example 2. If a Plank or Board be 15 Inches broad, and 20 Feet long, how many Feet are in it? *Answer*, 25 Feet; For the Proportion is this;

As 12 is to 15 the Breadth, so is 20 the Length, to 25 Feet, the Content of the Board: And by the Sector thus, as Lateral 15 is to Parallel 12, so is Parallel 20, to Lateral 25 Feet, the Content of the Plank.

PROB. IV. *The Use of the* Sector *in* Plane-Sailing.

Example 1. A Ship in 42d. 10m. North Latitude sails NE. by N. 104 Leagues; I demand the Latitude she is in, and her Departure from the Meridian?

The Proportions are these;

1. As Radius is to the Distance sailed, so is the Sine of the Course to the Departure from the Meridian. That is by the Sector, thus; As Lateral 104 Leagues (on the Line of Lines) is to Parallel Sine of 90 Degrees, so is Parallel Sine of 33 Degrees 45 Minutes (the Degrees of the Course from the Meridian) to Lateral 58 Leagues (on the Line of Lines) the Departure from the Meridian.

Note, If 104 Leagues taken Lateral, be troublesome to fit Parallel in the Sine of 90 Degrees, then take its half, or quarter laterally, and its Answer will be accordingly its half or quarter: As here, if you take 52 the half of 104 Leagues, the Answer will be 29, whose Double is 58 for the Departure from the Meridian, as before.

2. As Radius is to the Distance sailed, so is Sine Complement of the Course to the Difference of Latitude.

By the Sector *thus*;

As Lateral 104 Leagues is to the Parallel Sine of 90 Deg. so is Parallel Sine of 56 Deg. 15 Min. to the Lateral 87 Leagues, the Difference of Latitude; by which you may find the Latitude the Ship is in, as before, in the Use of the *Gunter*, in Pages 209 and 210.

Example

Example 2. A Ship ſails South Eaſterly 'till her Difference of Latitude be 275 Minutes, and the Departure from the Meridian 412 Minutes, I demand her Courſe and Diſtance ſailed ?

The Proportions are theſe;

1. As the Difference of Latitude, is to the Departure; ſo is Radius, to the Tangent of the Courſe: That is,

By the Sector thus:

As Lateral 412 Minutes, is to Parallel 275 Minutes; ſo is Parallel Tangent of 45d. (that being Radius now) to Lateral Tangent of 56d. 15m. the Courſe from the Meridian, which makes SE. by E.

2. As the Sine of the Courſe, is to the Departure; ſo is Radius, to the Diſtance ſailed.

By the Sector thus:

As Lateral 412 min. is to Parallel Sine 56 deg. 15 min. ſo is Parallel Sine of 90 deg. (that now being Radius) to Lateral 495 min. the Diſtance ſailed.

After this Manner may any Proportion be wrought by the Sector, which I leave for the Learner's Exciſe.

The Uſe of the following TABLES of Latitudes and Longitudes.

LAtitude and Longitude are two primary Affections of the Earth: By the Help of theſe two, the Geographer endeavours to repreſent the Parts of the Earth, that they may keep ſymmetry and Proportion with the Whole.

Latitude is an Arch of the Meridian, comprehended between the Equator and a Parallel: But Longitude is an Arch of the Equator, intercepted between the Meridian of London, in the following Tables, and the Meridian of any other Place.

For the exact ſettling of Latitude, we have many abſolute Helps; but to determine the Longitude of a Meridian,

and more eſpecially the Longitude of a Place at Sea, is that which hath, and ſtill wearies the greateſt Maſters of Geography.

I have endeavoured to ſettle the Longitude with as much Exactneſs as poſſibly I could: For I not only calculated according to the Latitude and Meridian Diſtance of each Place from the Meridian of London, which Meridian Diſtance I obtained from the exacteſt geographical Charts extant, but I conſulted the Reckonings of ſkilful Mariners, and when I found any Difference, I adjuſted it both according to Art and Reaſon.

As for Inſtance; I had from able Mariners, upon their long Experience, the Meridian Diſtance from Barbadoes to the Lizard: According to which I have ſettled the Longitude of all the eminent Places in the Weſt Indies.

And for the ſetling of the Longitudes of Places in the Eaſt-Indies, I conſulted Obſervations of Eclipſes, both ancient and modern; as in Page 161 Harmonicon Cœleſte, the Difference of Meridians between Goa and London is 5h. 48m. and Malacca and London, 6h. 49m. My Table hath the former of theſe 5d. 58m. and the latter 6h. 45m. The Difference between my Tables and the former of theſe Obſervations is 10m. and of the latter 4m. which Difference may be bore withal.

" If the Reader conſiders the Time, being in 1664, " with the great Labour and Pains (to my Knowledge, " being then his Servant) the Author beſtowed and ex- " pended in compiling this Work, the Performance may " juſtly be looked upon as then the beſt of its Kind.

" But ſince that Time there have been better Helps, " new Diſcoveries made, and new Places found out; the " Corrector, at the Requeſt of the Bookſellers, and out of " Reſpect to the deceaſed Author, but moſt of all for the " publick Good, hath made ſuch Amendments herein as " were poſſible, by comparing of the beſt Obſervations, " Tables, Charts, Maps, and Sea Journals he was able to " procure; ſo that it may be concluded theſe Tables are

" the

"the trueſt, or come in general, neareſt the Truth of any "extant in our Language; not that they are ſo exact in "every particular Place, as to need no Amendment in "Time, but with Reſpect to the preſent Help they are ſo.

"And now I could wiſh, that either Authority would "order, or that all Perſons concerned in conſtructing "Tables, Charts, and Maps, would mutually unite in a "fixed Meridian where to begin Longitude.

"For, although Longitude may be begun at any Meri-"dian, yet the Convenience of it beginning at one Meri-"dian in all our Navigation Books and Charts, would "render the Study and Practice of Navigation much "more pleaſant and eaſy than now it is: Such various "Beginnings and Countings of Longitudes occaſion ſome "to ſtumble, others to miſtake, and ſome to condemn all "to be falſe, by not conſidering the ſeveral Meridians "made Uſe of, which ſuch a wiſhed-for Union would "prevent.

"But this is not likely to be in my Time, who am "ſo near the Grave; yet ſhould it be ſet on Foot while "I am on this ſide the other World, my beſt Perform-"ances ſhould not be wanting to promote it, and ſhould "count all my ſpare Hours from neceſſary Preparations "for my laſt End, well ſpent in ſuch an uſeful and public "Good."

Note 1. I do begin the Longitude (in my Tables) at the Meridian of London, and increaſing it on both Sides the ſaid Meridian; that is to ſay, both Eaſtward and Weſtward, and end in 180 Degrees the oppoſite Meridian.

2. Therefore (according to this Account) all Places on the Eaſt Side of the Meridian of London lie in Eaſt Longitude; and, on the contrary, all on the Weſt Side of it lie in Weſt Longitude.

3. If a Ship be in Eaſt Longitude, ſailing to the Eaſtward, the Longitude increaſeth; but ſailing to the Weſtward the Longitude decreaſeth.

4. And on the contrary, if a Ship be in Weſt Longitude ſailing to the Weſtward, the Longitude increaſeth, and ſailing to the Eaſtward, it decreaſeth.

5. Take Notice, that all Places in Eaſt Longitude, the Sun cometh on their Meridian before he cometh on the Meridian of London. As thus; if a Place lie in 15 deg. Eaſt Longitude, the Sun cometh one Hour ſooner to the Meridian there, than he doth to the Meridian of London: If in 30 deg. Eaſt Longitude, than two Hours ſooner; if 45 deg. three Hours ſooner; if 60 Degrees four Hours ſooner; if 75 deg. five Hours ſooner; if 90 deg. ſix Hours ſooner; if 105 deg. ſeven Hours ſooner; and ſo you may reckon for any other Longitude. But on the contrary, all thoſe Places that lie in Weſt Longitude, the Sun or Star cometh on their Meridian after they are paſt the Meridian of London.

To find the Difference of Longitude between any two Places.

IF both Places be in Eaſt Longitude, or both in Weſt Longitude, ſubtract the leſs Longitude from the greater, the Remainder is the Difference of Longitude.

If one Place be in Eaſt Longitude, and the other in Weſt Longitude, add them both together, and their Sum is the Difference of Longitude, if it exceed not 180 deg. but when the Sum doth exceed 180 deg. ſubtract it from 360 deg. and the Remainder is the Difference of Longitude required.

Note, That the Longitudes of Places, tabulated in Mr. COLSON's Mariner's New Calendar, heretofore eſtimated from the Meridian of the Lizard, are in the laſt Edition of that Book, reduced to the Meridian of London.

A TABLE

A TABLE *containing the Chief Harbours, Headlands and Iſlands in the World, and ſhewing their Latitude and Longitude: Begining the ſaid Longitude at the Meridian of* London.

The Sea-Coaſt of Greenland.

Names of Places.	Latitude (North Latitude) D.	M.	Longitude (Eaſt Longitude) D.	M
HAcluits Headland	79	47	09	11
Fair Foreland	78	45	08	56
Cape Cold, the North-end of Charles Iſland	78	50	09	30
Black Point, South-end of it	78	13	10	33
Dear Sound	79	15	12	40
Foul Sonnd	77	20	13	00
Bell Sound	77	15	12	40
Horn Sound	76	50	13	26
Point Lookout	76	25	15	34
Helies Sound	78	55	21	50
Cape Barcan, or Barcam	78	15	22	11
Cape Blanco	77	55	20	10
Ducks Clove } Edges Iſland	77	35	23	10
Negro Point } Edges Iſland	76	55	23	30
Hope Iſland	76	18	23	40
Cherry Iſland, or Bear Iſland	74	30	18	20
Ice Point, or Cape Deſire	77	40	69	10
Admiralty Iſland	75	05	54	50
Langeneſs	74	40	53	36
Croſs Point	72	00	53	12
Fretum Burrough	70	00	61	20
Colgoyen Iſle	69	00	45	00
Cape Candenoſe	69	03	42	35
Cape Barſo	66	30	38	00

The Coaſts from Archangel to the Naze of Norway.

Names of Places.	Latitude D.	Latitude M.	Longitude D.	Longitude M.
	North Latitude		East Longitude	
Archangel	64	34	38	00
Cape Grace, or Cape Bona Fortuna	66	00	35	50
Cape Gallant, or Sweetnoſe	68	10	34	40
Kilduyn Iſland	69	30	31	20
River Kola Entrance	69	10	31	05
Fiſhers Iſland	70	00	26	38
North Cape	71	23	23	02
Tromſound Iſland	70	20	19	00
Iſland Sanien, South Weſt Point	69	35	13	00
Lœford, Weſt Point	68	15	09	40
Werro, or Weroy Iſland	67	30	07	30
Dronthem	63	20	10	59
Ranſdel	63	15	06	30
North Point	62	20	05	26
Katts Neſs, or Scuts Neſs South Point	61	45	03	36
Hearle Iſland the South-end	60	40	03	38
North Bergen	60	10	06	14
Bommel Iſland, North Point	59	25	05	40
Jedder	58	05	06	10
Naze of Norway	57	45	07	24
Maſterland	57	53	11	45

The Sea-Coaſts in the Sound.

Names of Places.	Latitude D.	North Latitude M	Longitude D.	East Longitude M.
Maerden	58	19	08	57
Caperwick	59	20	10	10
Anſlew, or Chriſtiana	59	40	10	00
Gottenberg	57	50	12	10
Cape Kol	56	30	12	13
Elſenberg	56	10	12	30
Valſtenborn	55	28	13	00
Chriſtianople	56	00	15	12
Calmer	56	40	16	35
Oeland the South-end	56	17	15	30
Oeland the North-end	57	20	17	00
Landford	58	40	18	20
Stockholm	59	20	18	80
Aboo	60	40	21	10
Raſeborg	60	28	22	35
Borgo	60	40	26	00
Pelting Sound	60	32	26	50
Wyburg	60	52	29	16
Peterſburg	60	00	30	25
Narva	59	07	29	15
Revel	59	27	24	51
Nargin Iſland	59	35	24	30
Sybranneſs in Dagoo, or Dagerort	59	00	23	00
Arenſberg in Geſel Iſland	58	20	23	32
Parnaw	58	30	25	47
Runen Iſland	57	55	24	00
Riga	57	00	24	55
Domeneſs	57	30	24	00

The Sea-Coasts in the Sound.

Names of Places.	Latitude D.	M.	Longitude D.	M.
	North Latitude		West Longitude	
Der Winda	57	15	22	06
Der Memel	55	48	21	36
Coningsburgh	54	43	21	35
Dantzic	54	22	18	36
Heel	54	40	19	08
Gotland, the North-end	58	00	20	15
Faro Sound	58	03	18	50
Gotland Wisbuy	57	30	18	30
Gotland, the Soath-end	57	00	17	45
Bornholm	55	12	15	40
Camin, or Hamin	54	10	15	00
Jasmond, or Rugen	54	40	14	00
Rostock	54	37	18	40
Strelsound	54	25	13	16
Wismar	54	10	12	00
Lubec	54	00	11	45
Copenhagen	55	41	12	50
Elsinore	56	22	12	40
Uraniberg	55	54	12	58
Anout, or Anholt Island	56	50	11	06
Leson, or Lesnow Island, Jesou	57	05	10	30
The Scaw	57	30	10	20

The Sea-Coasts of Holland and Flanders, from the Scaw to Calais.

	North Latitude		East Longitude	
Holy Land, or Heighland Isles	54	24	08	35
Hamburgh	53	41	10	38
Bremen	53	30	09	00
Embden	53	05	07	28
Ameland Island, or Amoyland	53	30	06	20
Scheling	53	27	05	58
The Fly	53	16	05	30

The Sea-Coaſts of Holland and Flanders, from the Scaw to Calais.

Names of Places.	Latitude D.	M.	Longitude D.	M.
The Texel	53	12	05	10
Amſterdam	52	23	05	14
Rotterdam	51	55	04	35
Antwerp	51	10	04	20
The Brill	52	00	04	00
Middleburgh in Zealand	51	37	03	58
Sluys	51	14	03	43
Oſtend	51	14	03	00
Dunkirk	51	04	02	27

North Latitude — Eaſt Longitude

The Sea-Coaſts about the Iſland of Iceland.

Names of Places.	Latitude D.	M.	Longitude D.	M.
Grim's Hole, or Geuberman's Rocks	66	23	22	30
Gamar Iſles, or Gille	65	48	26	54
Weſtmania Iſles	63	30	22	54
Rock Point	64	00	26	24
Snow Hill	65	11	27	14
Fair Foreland	60	20	26	23
Rage Point, or Orgal Bay	66	00	25	25
Marza, or Largeneſs	66	08	24	00
Grimſa Iſle	67	15	22	34
Langeneſs	66	46	12	50
Bargarers Point	66	20	16	35
Silly, or Pappy Iſles	64	50	12	10
Horn Bay	64	50	12	00
Merchants Foreland	63	24	17	05
Portland	64	02	21	05
Green's Iſland	66	50	24	40

North Latitude — Weſt Longitude

The Sea-Coasts of Scotland.

Names of Places.	Latitude D.	M.	Longitude D.	M.
Sky Island North-end	57	45	05	45
Island of Lewis, North-end	58	20	07	00
Ferro Head, or S. End	61	15	05	10
Shetland South-end	60	04	02	00
Fair Isle	59	30	01	24
Isles of Orkney	59	10	03	22
Cath Ness Point	58	40	02	36
Buchan Ness	57	45	01	18
Aberdeen	57	02	01	44
Dundee	56	28	02	40
Leith	56	00	02	56
Edenburgh	55	58	02	59
Berwick	55	45	01	55

(Latitude column marked: North Latitude; Longitude column marked: West Longitude)

The Sea-Coasts of England from Berwick to the Lizard.

Names of Places.	Latitude D.	M.	Longitude D.	M.	
Newcastle	55	12	01	30	W. Longitude
Sheiles, or Shields	55	02	01	23	W. Longitude
Sunderland	54	55	01	20	W. Longitude
Hartlepool	54	43	00	56	W. Longitude
Whitby	54	10	01	50	W. Longitude
Scarborough	54	20	00	40	W. Longitude
Flamborough Head	54	09	00	19	E. Lon.
Burlington	54	00	00	08	E. Lon.
The Spurn	53	35	00	30	E. Lon.
Hull	53	52	00	20	W
Grimesby	53	30	00	56	East Longitude
Boston	53	10	00	25	East Longitude
Lynn	52	55	00	32	East Longitude
Wells	53	10	01	00	East Longitude
Blackney	53	08	00	55	East Longitude
Cromer	53	10	01	05	East Longitude
Winterton	52	57	01	22	East Longitude
Yarmouth	52	52	01	38	East Longitude

(Latitude column marked: North Latitude)

The Sea-Coaſts of England from Berwick to the Lizard.

Names of Places.	Latitude D.	Latitude M.	Longitude D.	Longitude M.
Aldborough	52	20	01	25
Orfordneſs	52	12	01	16
Ipſwich	52	10	01	05
Harwich	52	05	01	18
Colcheſter	51	58	00	56
LONDON	51	31	00	00
Rocheſter	51	28	00	26
Margate	51	27	01	14
The North Foreland	51	27	01	24
Sandwich	51	25	01	14
The Downs	51	23	01	25
The South Foreland	51	10	01	20
Ripraps, a Sand	51	53	01	26
Dover	51	06	01	13
Dongeneſs	50	57	00	51
Rye	51	02	01	45
Beachy	50	46	00	25
Shoreham	50	55	00	17
Portſmouth	50	49	00	50
Iſle of Wight, Newport	50	42	01	25
Pool	50	56	01	54
Weymouth	50	42	02	40
Portland	50	30	02	44
Chiddock	50	46	02	52
Lime	50	43	02	58
Exmouth Bar	50	38	03	25
Berry Head, the S. Point of Torbay	50	26	03	30
Hopes Noſe, the N. Point of Torbay	50	30	03	30
Dartmouth Entrance	50	22	03	35
Start Point	50	06	03	45
Praule Point	50	15	03	45

North Latitude

East Longitude (London to Beachy); West Longitude (Shoreham to Praule Point)

The Sea-Coasts of England.

Names of Places.	Latitude D.	M		Longitude D.	M.	
The Eddystone	50	14	North Latitude	04	20	West Longitude
Plymouth	50	25		04	09	
Ramhead	50	21		04	34	
Foy	50	23		04	38	
Falmouth	50	11		05	01	
LIZARD	50	00		05	14	

The Sea-Coasts from the Lizard to Holy-Head.

Names of Places.	Latitude D.	M		Longitude D.	M.	
Land's End	50	06	North Latitude	06	00	West Longitude
Gulf	49	56		06	06	
Scilly Islands, St. Agnes Lighthouse	49	56		06	34	
Seven Stones	50	10		06	40	
Hartland Point	51	03		04	31	
Lundy Isle	51	13		04	38	
Mort Bay, or Mort Point	51	13		04	13	
Bristol	51	30		02	30	
Swansey	51	42		03	55	
Caldy Island	51	37		04	38	
Milford	51	43		05	00	
St. David's Head	51	56		05	11	
Barsey, or Bardsey Island	52	50		04	35	
Liverpool	53	20		03	00	
Winchester	53	37		04	20	
Lancaster	54	42		04	36	
White Haven	54	17		03	30	
Isle of Man, West-end	53	45		05	00	
Holy-Head	53	23		04	40	

The Sea-Coasts of Ireland.

Names of Places.	Latitude D.	Latitude M. (North Latitude.)	Longitude D.	Longitude M. (West Longitude.)
Fair Foreland	55	05	06	30
London Derry	55	00	07	50
Island Torre	55	09	08	30
Isles of Arran	54	48	08	59
Stags of Broad Haven	54	07	10	06
Isles of Arian	54	55	10	03
Galway	53	07	09	40
Gall, or Doen's Head	52	40	09	30
Lupis's Head	52	24	10	15
Limrick	52	23	09	45
Blasques	52	00	11	56
Skillocks	51	30	11	55
Cow and Calf	51	22	10	36
Mizan, or Missen Head	51	16	11	30
Old Head of Kinsale	51	35	08	58
Cape Clear	51	17	11	10
Kinsale	51	50	09	40
Cork	51	45	07	30
Waterford	52	09	08	40
Wexford	52	13	07	27
Dublin	53	12	06	55
Lumboy Island	53	24	07	30

The Sea-Coasts of France.

Names of Places.	Latitude D.	Latitude M. (North Latitude)	Longitude D.	Longitude M. (E. Long.)
Calais	50	58	01	56
Dieppe	49	56	01	09
St. Vallery	50	10	00	56
Sain Head, Cape de Antiser	49	44	00	34
Rouen Mouth	49	34	00	30
Cape Barfleur	49	38	01	16W
Çape de la Hogue	49	47	02	00W

The Sea-Coasts of France.

Names of Places.	Latitude (North Latitude) D.	M.	Longitude (West Longitude) D.	M.
Alderney	49	50	02	12
Caskets	49	50	02	20
Guernsey	49	33	02	40
Jersey	49	05	02	26
St. Maloes	48	39	01	57
Morlaix	48	33	03	49
Island de Bass	48	50	04	00
Ushant	48	30	05	02
Conquet	48	27	05	00
Brest	48	23	04	26
Camarita Bay	48	25	04	28
Seams	48	02	05	00
West Penmark	47	48	04	24
Bell Isle	47	21	03	16
Nantz	47	14	01	39
Heys Isle	46	24	02	14
Isle de Rey the Middle	46	10	01	30
Isles of Oleron	45	56	01	00
Rochel	46	10	01	11
Bourdeau City	44	50	00	30
St. Sebastian	43	24	01	27
Bilboa	43	29	02	58
Cape Pinas	43	56	06	00
Cape Ortegal	43	47	08	32
Cape Corunna, or Groin	43	28	09	20
Cape Finisterre	43	15	09	40
Isles of Bojona	42	29	09	27
Oporto	40	50	09	35
Burlings	39	35	09	48
Rock of Lisbon	38	42	09	50
Lisbon	38	42	08	53
Cape St Vincent	36	53	09	06
Cape St. Maria	36	58	08	30
Cadiz	36	33	06	00

The Coafts on the Main Continent within the Straits.

Names of Places.	Latitude D.	M.	Longitude D.	M.
Gibralter	36	12	04	53W
Malaga	36	48	03	50W
Cape de Gat	36	30	02	05W
Cape Paul	38	15	00	15W
Alicant	38	35	00	05W
Cape St. Martin	38	46	00	40
Barcelona	41	26	02	18
Marfeilles	43	18	05	27
Toulon	43	07	06	02
Genoa	44	25	08	43
Leghorn	43	38	10	25
Civita Vechia	42	10	12	25
Rome	41	54 North Latitude	12	45 Eaft Longitude
Naples	40	51	14	46
Cape Spartevento	37	50	16	45
Cape Colonne	38	56	18	05
Gallipoli	39	56	18	43
Cape St. Maria, or Lucia	39	45	18	30
Ancona	43	40	14	26
Venetia, or Venice	45	25	12	10
Zara	44	30	16	35
Ragufa	42	45	20	00
Cattaro	42	47	19	17
La Valona	40	45	20	05
Point Palerma	40	00	20	15
Lepanto	38	20	22	02
Cape Matapan, or Caliga	36	33	22	41
Cape St. Angelo, or Angulo	36	32	23	56
Athens	37	58	24	05

The Coaſts on the Main Continent within the Straits.

Names of Places.	Latitude (North Latitude) D.	M.	Longitude (Eaſt Longitude) D.	M.
Cape Martelo, South Point of Negropont	38	07	25	03
Cape Colon, or Collonne	37	45	24	42
Salonechi	40	41	23	13
Cape Monte Sancto	40	26	25	02
Gallipoli	40	33	27	20
Conſtantinople	40	59	28	58
Cape Barbador, or Baba	39	30	26	30
Smyrna	38	28	27	25
Cape Barbernola, or Blane	38	09	26	32
Epheſus	38	00	27	53
Antiochetta	36	30	32	46
Scandaroon, or Alexandretra	36	34	36	30
Antioch	36	11	36	15
Aleppo	35	45	37	24
Tortoſa	35	00	36	30
Tripoly	34	38	36	15
Joppa, or Jaffa	32	27	35	20
Jeruſalem	31	51	35	25
Alexandria	31	10	30	19
Cape Ruſato	32	48	21	25
Cape Meſurato	32	21	16	17
Tripoly	32	54	13	10
Suſa	35	53	10	34
Cape Bona	37	13	10	04
Tunis	36	50	10	17
Bona	37	08	07	10
Seven Capes	37	15	07	00
Gigeri	37	14	06	15
Cape Tidelles, or Dellys	37	15	04	18
Algier	36	50	03	16
Cape Tenes	36	45	01	50
Orain	36	02	00	26
Cape Tres Forcas	35	30	02	04W
Ceuta	35	54	04	45W
Tangier	35	52	05	42W

Iſlands within the Straits.

Names of Places.		Latitude D.	Latitude M.	Longit. D.	Longit. M.
Formentura		38	33	01	55
Ivica		38	50	01	40
Majorca		39	46	02	03
Minorca		39	51	03	52
C. Tolare, South	End of Sardinia	38	46	09	12
C. Corſo, North	End of Sardinia	41	10	09	50
Aſinaria		41	03	09	08
Bonifacio, South	End of Corſica	41	24	09	46
C. Corſo, North	End of Corſica	42	56	09	50
Capri, or Captia		43	03	10	17
Lilboa, or Elba		42	45	11	00
Planoſa		42	30	10	45
M. Chriſto		42	17	11	00
Palmarolla, or Palmeria		41	03	13	35
Ponſa		41	00	13	37
Iſcia, or Eſchia		40	54	14	30
Strombello		38	58	16	00
Velcanello		38	27	15	33
Fellicur		38	30	15	00
Allicur		38	28	14	42
Uſtica		38	36	13	52
Trapano Weſt End of	Sicilly	37	57	13	13
Palermo in	Sicilly	38	06	13	50
C. Paſſaro Eaſt. End of	Sicilly	36	38	15	40
Meſſina in	Sicilly	38	07	16	20
qiracuſa in	Sicilly	37	03	15	45
C. Molin in	Sicilly	37	42	15	56
Pantalaria		36	48	12	20
Limoſa		35	56	13	11
Lampidoſa		35	34	12	46
I. Malta		35	53	14	34
Ouvre Poel, a Rock		35	45	16	36
Grande, or I. Longo		44	25	16	18

North Latitude. East Longitude.

Islands within the Straits

Names of Places.	Latitude D.	M.	Longitude D.	M.
	North Latitude		East Longitude	
Poma	43	10	16	08
St. Andrea	43	12	16	26
Lissa	42	46	18	40
St. Agusta	42	40	18	56
Corzola	43	03	17	32
Melada	42	52	18	06
Corfu	39	50	19	46
Chephalonia	38	15	21	00
Zant	37	46	21	30
Sapiensa	36	40	21	45

Islands in the Archipelago.

Names of Places.	Latitude D.	M.	Longitude D.	M.
	North Latitude		East Longitude	
Tasso	40	40	25	17
Lemnos	39	59	25	37
Metyline { Cape Sygre	39	15	26	05
Metyline { P. Olivia	38	57	27	00
Siatto, or Schate	39	22	23	58
Scio, or Xio	38	22	26	12
Patmos	37	20	26	45
Tino	37	35	25	36
Zio, or Sea	37	37	24	50
Ferminia, Fermina, or Termine	37	24	24	58
Ferfante, or Sisanto	36	58	25	20
Millo, Mila, or Melo	36	40	25	00
W. end of Caudia { Cape St. John	35	15	24	00
E. end of Caudia { C. Solomon	35	00	27	08
Rhodes { North-end	36	27	28	38
Rhodes { South-end of C. Tranquill	36	01	28	28
S.W end of Cyprus { C. Baffa	34	57	32	23
East end of Cyprus { C. St. Andrea	35	31	35	00
S. end of Cyprus { C. de Gaffe	34	30	33	10

The Sea-Coaſt of Barbary and Guiney, from Tangier to Cape Bona Eſperance,

Names of Places.	Latitude D.	Latitude M.		Longit. D.	Longit. M.	
Cape Spartel	35	46	North Latitude	05	49	Weſt Longitude
Salle	33	58		06	20	
Cape Cantin	32	46		09	10	
Cape de Geer	30	27		10	06	
Cape de Non	28	15		11	04	
Cape Bajadore	26	04		15	35	
Cape Blanco	20	45		17	25	
Cape de Verde	14	43		17	20	
River Gambia's Entrance	13	08		15	31	
Cape Roxo	11	50		15	04	
Cape de Monte, or Mount	06	23		12	00	
River Seſter, or Seſtos	05	24		08	36	
Cape de Palmas	05	23		06	00	
River St. Andrea	05	05		04	15	
Cape Three Points	04	28		01	50	
Cape Corſe	05	15		00	23	Eaſt Longitude
River de Volta, or Accara	05	55		03	25	
Cape Formoſa	04	15		06	40	
New Calabar Entrance	04	42		08	33	
Old Calabar Entrance	04	10		09	45	
River de Camarones	03	25		10	10	
Iſland Fernand Poo	02	40		10	30	
Iſland de Prince, or Prince's	01	40		09	15	
River de Anger, or Angra	00	50		10	01	
Iſland St Thomas	00	00		08	00	
Iſland St. Matthews	01	30	South Latitude	06	01	W
Iſland Aſcenſion	07	50		14	01	W
Iſland Anabona	02	10		07	27	E
Cape Lopas	00	55		09	55	E
Cape Negro	16	08		12	31	E
Iſland St. Helena Nova	16	00		06	04	E
Iſland St. Helena	16	06		05	50	W
River Congou	05	40		15	25	E
Cape St. Thomas	24	50		14	43	E

The Sea-Coaſt of Barbary and Guiney, from Tangier to Cape Bona Eſperance.

Names of Places.	Latitude D.	M		Longitude D.	M.
Cape Secos, Sego, or Seca	29	00	S. Lat.	15	56E
Cape Bona Eſperance	34	07		18	40E
Cape Aguilhas, or Lagullas	34	54		21	20E
Iſland Triſtian de Acunha	37	05		13	50W

The Sea-Coaſt of Brazil.

Iſland St. Paul	01	20	South Latitude	25	30	West Longitude
Para River	02	50		42	47	
Cape St. Roque	05	00		35	47	
Rio Grande	05	20		35	57	
Pernambuco	08	30		35	07	
Cape St. Auguſtin	08	48		35	10	
Iſland Ferdinande Lorenha	03	50		31	10	
River St. Franciſco	10	56		36	40	
Bay de Todos Sanctos	13	06		38	50	
Port Segura	16	56		40	00	
Cape de Abrolhos	18	15		41	07	
Spirito Sancto	20	25		40	00	
Cape St. Thomas	22	10		42	15	
Cape Frio	23	00		42	20	
Iſland St. Catherines	27	50		48	00	
River Grande's Entrance	31	55		52	00	
Cape St. Waria	34	30		56	40	
River de la Plata, or Cape St. Antonio	35	40		67	36	
Cape de St. Andreas	38	40		63	05	
Bay Sinfunda, or Sinfendo	42	35		68	00	
Point de los Leones	44	00		70	40	
River Camerones	45	30		73	00	
Cape Blanco	46	50		72	07	
Pepy's Iſle	47	20		66	40	
Point of River St. Julian	48	40		74	34	
Cape Virgin Mary of Magel, Straits	52	00		75	05	
Le Maire Strait	54	34		73	01	

The Sea-Coasts of Brazil.

Names of Places.	Latitude. D.	M.		Longitude D.	M.	
C. Horn, the S. Part of Terra del Fuego	55	22	South Latitude	67	02	West Longitude
Island dos Picos	22	30		25	15	
Island de Martinvas	19	30		26	55	
Island St. Maria de Agosta	19	40		29	10	
Island Trinidada	20	30		30	00	
Island Ascension	08	0		14	30	

The Coasts on the Main Continent in the East-Indies.

Names of Places.	Latitude. D.	M.		Longitude D.	M.	
Bay de Allogoor Dallagoa	25	30	South Latitude	31	05	East Longitude
River St. Lucia	28	20		32	17	
Cape St. Martin, or Maria	22	40		35	05	
Cape Corientes	23	40		36	17	
Mosambique	15	02		41	40	
P. de Aquada, or Del Gada	10	17		40	10	
Cape de Falso	09	00		39	20	
Tongon	04	50		38	59	
Mombaso	03	50		38	30	
Molinde, or Melinde	02	58		39	35	
River Lamos	01	20		40	13	
Magadoxa	02	50	North Latitude	45	20	
Cape de Bassas, or Boxos	04	06		47	38	
Cape de Gardefoy	11	14		51	20	
Aden	13	00		47	00	
Mocha	14	10		44	50	
Cape Matriaca	15	23		52	10	
Defar	17	00		55	35	
Cape Resulgat	22	41		59	45	
Muscat	23	12		57	45	
Bassora, or Busero	29	45		49	20	
Gambaroon	27	20		56	40	
Cape Glado	25	50		63	34	

The Sea-Coasts on the Main Continent in the East-Indies.

Names of Places.	Latitude D.	Latitude M.	Longit. D.	Longit. M.
River de Sinda, or Cinde	24	45	67	35
Dia Head	21	02	69	50
Surat	21	10	72	25
Deman	20	06	73	30
Bombay Island	19	18	73	06
St. John's	19	55	73	20
Chaule, or Choale	18	31	73	37
Dabul	18	23	74	30
Rajapour Isle	17	02	74	10
Goa	15	31	73	50
Carwar	14	47	75	00
Manquelore	12	53	75	25
Tellecherry	11	42	75	25
Calecut	11	16	75	39
Cannanon	10	22	75	35
Cochin	09	54	75	55
Anjanga	08	29	76	25
Cape Comarin	07	50	77	25
Columbo in Zeylone	07	07	79	30
Point de Galie, or Gallo, on the same	06	10	80	10
Dundre Head on the same	06	02	80	45
Trinconomale	08	40	81	40
Great Bassos Shoals	06	23	81	45
Jetrapatam	09	05	80	10
Negrapatam	11	01	79	55
Tincumbar	11	15	79	50
Porto Nova	11	45	79	44
Pondicherry	11	54	80	06
Fort St. David, or Tregapatam	12	05	80	55
Conymere	12	35	80	05
Fort St George, or Madrassapatam	13	11	80	12
Palliakate	13	40	80	50
Armegon	14	16	80	12
Petapoli	16	16	81	11
Due Point, or Mecha	16	08	81	32
Masulipatam	16	28	81	40

North Latitude — East Longitude

The Sea-Coasts on the Main Continent in the East-Indies

Names of Places.	Latitude D.	M.	Longit. D.	M.
Massipore	16	30	81	57
Visagapatam	17	43	83	57
Birmlapatam	17	51	84	09
Pondy	18	49	85	15
Jacarnaut Pagod	19	51	86	42
Atsepure	29	11	87	23
C. Palmiras	20	40	87	35
Balasore Road	21	16	87	48
Piply	21	25	87	57
Hughly	23	09	89	05
Dacca	23	57	90	55
Casimbazar	25	06	88	45
River Bengal	22	17	92	21
River Aracan	20	10	93	40
Pegu	17	05	96	56
Melacca	02	12	102	10
Formosa N. Point	21	25	121	26
Point Romania	01	16	103	15
Point Cui	12	10	99	02
Siam Entrance	14	18	100	55
Cambodia Entrance	10	28	105	00
Cape Anarilla, or Avarilla	13	25	108	03
Cochin, or Chinchen	14	05	107	56
Tonquin	20	50	105	40
Canton	23	08	113	08
Amoye Island	24	35	116	50
Hocksew	26	30	118	20
River Swadia	27	51	118	50
Liampo, Lingpo, or Ningpo	29	59	120	35
Island Chusan	32	06	118	35
Nankin	32	07	118	31
Pekin	39	54	116	28

North Latitude. East Longitude.

Islands in the East Indies.

St. Paul	38	20	75	25
Romerans de Castelamas	28	45	67	17
St. Joan de Lisbon	25	24	53	30
Diego Roys	19	50	61	20

S. Lat. E. Long.

Iſlands in the Eaſt-Indies.

Names of Places.	Latitude D.	M.	Longitude D.	M.
St. Brandon	16	38	64	30
Mauritius	20	10	57	35
Malha	11	15	60	30
C. St. Mary S. } End of St. Laurence	25	33	46	10
C. D' Ambre N. } End of St. Laurence	12	10	51	05
St. John de Nova	17	21	43	20
St. Chriſtova	17	36	43	40
Mayetta	13	04	36	18
Joanna	12	10	45	03
Mohilla	12	05	44	23
Comero, or Angazecha	11	40	43	50
Morſia, or Monſia	08	07	40	15
Zanzebar	06	48	39	57
Penda	05	20	39	35
Comero	10	30	44	39
Coſmoledo	10	24	51	17
Juan de Nova	09	30	52	40
Aſtore Iſle	09	55	53	50
Agalega, or Gallega	09	47	54	31
Setta Hermanes	02	47	59	13
Quevelo, or Quebello	03	53	52	36
Baſſas de Banhas	05	05	48	46
Hermanos	03	32	54	45
Iſland Gratio	06	10	63	01
Padra Banhas	02	10	65	32
Baſſas de Chagos, or the Iſland Chagos	06	55	68	45
Three Germans	04	30	62	43
Croſs Iſland	04	10	58	05
Sacatora, or Zacatora	12	21 N	54	05
Iſland Abdeleur	12	04 N	53	04
Cubello	08	10 N	71	45
Malique	09	00 N	72	58
Garipe, or Gripe	10	40 N	72	37

South Latitude. East Longitude.

Iſlands in the Eaſt-Indies.

Names of Places.	Latitude (North Latitude) D.	M.	Longitude (East Longitude) D.	M.
Qualpena	10	00	73	30
Andomahon, or Antada	11	10	73	32
Ceylone South End, C. Gallo	06	08	81	15
Waldiviæ South Part	00	25	76	22
Waldiviæ North Part	07	14	73	04
Yas de Diego Reys	00	20	72	00
Mamila	14	25	117	06
Aynian N.W. Point	19	30	107	00
Aynian N.E. Point	19	55	109	55
Japan S.E. Point	35	30	140	30
Japan S.W. Point	35	00	128	30
Kocas	04	10	91	02
Andaman the Middle	12	35	93	19
Borneo W. Point	03	50	108	58
Nicobar	07	11	93	40
North-Weſt End of Sumatra	05	22	94	50
Bencola	03	55S	104	00
South-Eaſt End of Sumatra	05	22S	105	50
Jambe	01	19S	102	55
Bantam	06	14S	106	25
Batavia	06	16S	106	16

The Southern Iſlands, or Cape de Verde Iſlands.

Names of Places.	Latitude (North Latitude) D.	M.	Longitude (West Longitude) D.	M.
St. Antonio	17	35	24	26
St. Vincent	17	15	24	25
St. Lucia, or Round Iſland	17	07	24	20
St. Nicholas	17	00	23	38
Iſle de Sal	16	55	21	56
Bonaviſta	16	05	22	08
Mayo, or Iſland May	15	14	22	08
St. Jago	15	08	22	45
Fuego, or Fulgo	14	50	23	45
Brava's	14	28	23	44

The Canary Islands.

Names of Places.	Latitude D. (North Latitude.)	M.	Longitude D. (West Longitude)	M.
Sancto Porto	32	58	16	20
Madeira West-end	32	23	17	13
Salvages	30	14	15	00
Palma	28	40	17	50
Ferro	27	54	17	45
Gomero	28	06	17	05
Pico Teneriff	28	13	16	28
Grand Canaria	27	52	15	10
Allegansa	29	40	12	13
Lancerota	29	30	12	25
Forteventura South-West End	28	05	13	30

The Western Islands.

Names of Places.	Latitude D. (North Latitude)	M.	Longitude D. (West Longitude.)	M.
Corvo	39	48	31	25
Flores	39	32	30	54
Fyal	38	33	28	05
Pico	38	40	27	50
St. George	38	50	26	03
Tercera	38	57	27	04
Gratiosa in Eura	39	06	26	11
Wha e Fish	39	37	25	11
Vajo, or Vegia	38	43	23	48
St. Michael	38	06	23	36
Formigas, or Hormigas	37	40	22	47
St. Maries	36	59	22	58

The Sea-Coast of the North Part of America, Hudson's Bay, and Newfoundland.

Names of Places.	Latitude D. (North Latitude)	M.	Longitude D. (West Longitude)	M.
Cape Farewell	59	45	44	45
Cape Elizabeth	62	03	66	50
Island Resolution	61	50	65	04
Queen Anne's Foreland	63	48	54	45
Salvages Island	62	40	70	17
Salisbury Island	63	45	77	15
Mill's Isle	64	26	80	18
Nottingham Isle	63	30	76	53

The Sea-Coasts of the North Part of America, Hudson's Bay, and Newfoundland.

Names of Places.	Latitude		Longitude	
	D:	M.	D.	M.
Shark Point	64	30	82	55
Cape Southampton	61	55	86	18
Sir Thomas Roe's Welcome	64	15	92	04
Cape Churchill	59	00	95	16
Port Nelson, or York Fort	57	10	93	58
New Severn	56	00	88	20
Cape Henrietta Maria	55	07	84	30
Viner's Isle	53	05	84	03
Albany Fort	52	26	84	50
Mouse River's Mouth	51	18	83	13
Point Comfort	51	24	81	11
Frenchman's River	51	20	80	14
Rupert's River	51	30	79	26
Chalton's Island	52	08	81	20
Danby's Island	52	15	80	56
Shepherd's Island	51	45	80	48
Solomon's Temple Island	53	35	81	00
Weston's Island	52	58	82	48
Cubb's Island	54	16	82	40
Bear's Island	54	25	83	45
Baker's Dozen's Island	57	56	81	25
Sleeper's Isles	60	10	81	30
Mansfield's Isle, the middle	61	42	80	30
Cape Jones	54	55	78	58
Cape Walsingham	62	35	77	55
Cape Charles	62	48	75	30
Button's Isle	60	25	66	27
Bell Island	52	07	55	35
Gray's Island	50	35	53	25
Cape St John	50	25	52	48
Pengwin Island	50	00	50	50
Cape Bonavista	49	15	52	12

North Latitude

West Longitude

The Sea-Coaſts of Hudſon's-Bay, Newfoundland, and New England.

Names of Places.	Latitude D.	M.	Longitude D.	M.
	North Latitude		West Longitude	
Trinity Bay Entrance	48	52	52	20
Barcaleau Iſland	49	40	51	56
Conception Bay Entrance	58	20	52	08
Cape St. Francis	48	09	51	46
Cape Race	46	40	51	52
Bay of Bulls	47	50	51	29
St. John's Harbour	48	00	51	39
Cape St. Maria	47	10	53	23
Placentia Bay	47	45	53	58
Cape St. Laurenſa	47	30	54	23
Iſland St. Paul	47	10	58	18
Cape Roye	48	00	57	40
Virgin Rocks	46	06	51	07
French Factory	50	10	61	10
Bay of Breſt	52	10	56	57
Tadouſack	49	00	67	05
Quebeck	46	55	69	48
Anti Coſti Iſland, the Middle	49	40	69	45
Cape St. Charles, or Charles Straits	52	10	55	00
Cape Britain I. Scateri	46	08	58	30
Cape Sable	43	56	66	28
Point, or Port Royal	44	45	65	40
Penobſcut River	44	40	67	10
North Yarmouth	44	14	67	58
Paſcataway Entrance	43	26	70	10
Cape Ann Iſland	42	46	69	45
Cape Codd	42	15	69	25
Boſton	42	25	70	37
Plymouth	42	02	68	50
South of St. George's Bank	41	45	67	15
South End of Nantucket Shoals	49	50	68	23
Nantucket Iſland	41	15	68	48
Martha's Vineyard	41	14	60	09

The Sea-Coaſts on the Main Continent in the Weſt-Indies

Names of Places.	Longitude D.	Longitude M.	Longitude D.	Longitude M.
Elizabeth's Iſland	41	35	69	13
Block Iſland	41	15	69	58
Montock Point	41	18	70	20
Fiſher's Iſland	41	20	70	40
New York	40	42	74	14
Sandy Hook	40	28	74	15
Cape James, or Henlopen	38	48	75	28
Philadelphia	40	50	74	10
Cape May	39	00	75	15
Cape Charles	37	11	76	11
Cape Henry	36	58	76	23
Cape Hatteras	35	25	76	20
Cape Feare	33	58	76	50
Cape Roman, or Cattit	33	27	77	54
Aſhley River, or Charles Town	33	05	78	46
Port Royal	32	00	79	43
Bay of St. Auguſtine	30	10	80	43
Cape Florida	24	57	80	30
Laphillapina, or Apalachia	29	47	84	44
River Spiritus Sanctus, or Miſchiſippi River's Mouth	28	54	96	50
Tompeck	22	20	100	15
Liva, or Vera Cruz	19	12	97	48
Sierra, or Cape de Martin	19	10	95	45
Triſte, or Trieſt Iſland	18	10	91	20
Campecha	19	20	92	10
Cape Condeſedo	20	40	89	40
Cape Catocha	21	10	86	10
Salamancha	16	50	89	10
Cape Honduras	16	25	85	25
Cape Cameron	16	10	83	30

North Latitude — Weſt Longitude

The Coaſts on the ain Continent in the Weſt-Indies.

Names of Places.	Latitude (North Latitude) D.	M.	Longit. (Weſt Longitude) D.	M
Entrance of Nicaragua	11	25	85	15
Porto Bello	09	33	79	45
Darien, or Scotch Settlement	08	30	78	45
Carthagena	10	28	75	21
Cape Conquiquaco, or Coquibaco	12	40	70	42
Iſland Curaſoa, or Quicaſo	12	10	68	15
Iſland Margaritta	11	20	63	20
Iſland Trinidada	10	15	60	17
Mouth of Oronoque River	08	15	59	25
Cape Three Points	10	30	62	10
Cape Naſſau	07	55	57	55
N. Cape, the middle of Caopory Iſland	02	05	49	56
Suranam	06	25	56	50
Cape Orange	04	25	50	55
Mouth Amazones River	00	00	49	56

Iſlands in the Weſt Indies.

Names of Places.	Latitude (North Latitude) D.	M.	Longit. (Weſt Longitude) D.	M
Tobago Weſt-end	11	20	59	52
Barbadoes, at Bridge-Town	13	08	59	50
Granada	11	57	60	20
Granadillos	12	20	59	55
Boquia	12	50	59	53
St. Vincent	13	12	60	12
St. Lucia	13	45	61	04
Martinica	14	43	60	54
Dominica	15	23	60	30
Marigallanta	15	58	60	20
Guardalupa	16	10	61	15
Deſſeada	16	20	60	10
Antegua	17	05	61	45
Barbuda	18	06	61	40
Monſerat	16	35	62	13
Rodondo	6	55	61	15

Islands in the West-Indies.

Names of Places.	Latitude D.	Latitude M.	Longitude D.	Longitude M.
Nevis	17	00	62	42
St. Christophers	17	17	62	50
Eustatia	17	25	62	20
Saba	17	35	62	40
St. Bartholomew	17	52	62	05
St. Martin's	18	06	62	10
Anguilla	18	17	62	13
Sambrero	18	35	62	30
Anegada	18	47	62	46
St. Cruz	17	55	65	52
Virgins	18	30	63	25
St. Thomas	18	30	63	22
St. John de Port Rico	18	30	65	37
Islands and Rocks of Aves	12	01 North Latitude	64	30 West Longitude
Tortuga, or Tortugas	11	10	63	54
Margaritta	11	16	63	36
Blanco	11	50	63	40
Testigos	11	35	62	41
D'Orchila	11	45	64	30
Bonairy, or Bonaire	12	12	66	28
Aruba	12	50	68	28
East-end of Hispaniola	18	18	69	15
West-end of the same	18	26	74	36
East end of Jamaica	18	00	75	40
Port Royal Jamaica	17	50	76	32
West-end of the same	18	08	79	00
East-end of Cuba	20	15	74	50
Havannah	23	10	81	41
West-end of Cuba	21	40	86	30
La Bermudas	32	25	66	40
Bahama Island	26	50	78	36
Abaco South-end	26	00	75	05
Andrews, or Andross, or North-end	25	10	78	40
Providence	25	00	77	00

Iſlands in the Weſt-Indies

Names of Places.	Latitude D.	M.	Longit. D.	M.
Harbour Iſland	25	37	76	47
Eleuthera South-End, or Hathern	24	40	75	56
Cat Iſland, the Middle	24	25	75	09
Watling's Iſland	23	43	74	25
Rum Key	23	45	74	50
Exuma	23	22	75	55
Crooked Iſland, North-End	22	56	74	12
Long Iſland, South-End	22	41	74	52
Atwood's Key	23	10	73	35
Mayaguana	22	35	72	46
French Keys	22	40	73	40
Merapervouz	21	58	74	45
Hogſties	21	17	73	55
Hineago, Weſt-End	20	25	73	49
Weſt Caicos	21	38	71	58
Turk's Iſland	21	35	70	08
Abrollo Bank, the North-End	21	35	69	46
Plate Rack	20	10	68	15
Mucacres	21	30	76	35
Verd	21	17	76	16
Cajad Zal	23	10	79	24
Pinos	21	20	84	20
Great Camains	18	54	81	29
Little Camains	19	30	80	24
St. Andero	12	33	81	27
Caimanuback	19	08	80	11
Pedro Shoals, North Side	17	10	77	56
St. Milan	17	10	81	28
Guayna	16	53	88	30
Cozumelli	19	30	89	05
Zuna Quita	17	01	89	48
Mexico	20	00	103	35

North Latitude — West Longitude

F I N I S.

These following were ſettled from Obſervations of the Moon's Diſtance from the Sun and Stars, made by Meſſrs. W. WALES, F. R. S. and W. BAYLY, Aſtronomers, during Captain COOK's Voyage towards the South Pole, and round the World, in His Majeſty's Ships the *Reſolution* and *Adventure*, in the Years 1772, 1773, 1774, and 1775.

Names of Places.	Latitude (South Latitude) D.	M.	Longit. fr. Lond. (East Longitude) D.	M.
CAPE of Good Hope	33	55	18	25
Duſky Bay, New Zealand	45	47	166	20
Charlotte's Sound, new Zealand	41	06	174	22
Point Venus, Otaheite	17	29	210	26
I. Ohitahoo, one of the Marquiſas	9	55	220	54
I. Tanna, one of the New Hebrides	19	32	169	47
I Pudyoua, New Caledonia	20	18	164	44
Chriſtmas Sound, Terra del Fuego	55	22	290	00
C. Deſolation	55	13	288	37
York Minſter	55	31	290	18
C. Horne	55	59	292	37
I. Uliatea	16	45	208	26
I. Huaheine	16	45	208	51
I. Eaoowe, or Middleburg	21	21	185	29
Tonga Tabu, or Amſterdam, friendly Iſles	21	04	185	13
Pyleſtaert Iſland	22	23	184	15
Tolago Bay	38	21	178	36
Portland	39	35	178	15
Mew Stone off Van Diemens Land	43	48	146	30
Adventure Bay in Ditto	43	23	147	33
Cook's Streights	40	48	175	07

Names of Places.	Latitude D.	M.	Longit. fr. Lond. D.	M.
C. Palliser, N. Zealand	41	35	175	03
Easter I. North-west Side	27	08	250	11
Resolution Bay, Ohitahoo, one of Marquisas	9	55	220	57
Bolabola	16	32	208	11
Savage Island	19	02	190	32
Turtle Island	19	49	182	6
Annamocka, one of the friendly Isles	20	15	185	32
Mallicola, Sandwich Harbour	16	24	167	53
Cape Quiros, Terra del Espiritu Sancto	14	56	167	23
Botany Island	22	26	167	20
East Cape of Staten Island	54	54	295	16
South Thule	59	34	332	18
Cape Montagu, N. 45 E.	58	33	333	17
Harvey's Islands	19	16	201	16
Howe's Island	16	46	205	56
Palmerston's Island	18	00	197	06
Southern King George's Island	14	34	212	44
Palliser's Isles	15	38	213	33
Taoukaa	14	29	214	53
Friendly Isles, sundry, which extend from	19	37	185	10
to	20	32	185	50
Aurora, North End	14	52	168	16
Whitsuntide Isle, N. End	15	28	168	24
Maskelyne's Islands	16	30	168	00
Shepherd's Islands	16	56	168	44
Sandwich's Island	17	29	168	25
Hinchinbrook Island	17	25	168	38
Montagu Island	17	26	168	33
Traitor's Head	18	43	169	23
St. Bartholomew Island	15	42	167	20
Cape Cumberland	14	39	166	50
Cape Colinet	20	30	164	59
Cape Coronation	22	05	167	11
Queen Charlotte's Foreland	22	15	167	15
Isle of Pines	22	38	167	41
Norfolk Island	29	02	168	13
Cape Disseada	53	04	285	45

South Latitude

East Longitude

Names of Places.	Latitude D.	M.		Longit. fr. Lond. D.	M.	
Cape Noir	54	32		287	59	
St. Ildefonſo's Iſles	55	51		290	35	
Evout's Iſles	55	34		293	04	
Cape St Diego	54	33		294	49	
New Year's Harbour, Staten Land	54	48		295	52	
Cape St. Juan	54	47		296	16	
Willis's Iſles	54	00		321	33	Eaſt Longitude.
Cape North	54	05		321	48	
Cape Saunders	54	06	South Latitude	323	05	
Cape George	54	17		323	30	
Cape Charlotte	54	32		323	51	
Clerke's Iſles	55	05		325	21	
Friezland's Peak	59	02		333	07	
Saunders Iſle	58	00		333	05	
Candlemas Iſles	57	10		332	50	
St. Helena	15	55		5	49	
Iſland Aſcenſion	07	57		14	27	
Iſl. Ferdinando de Noronha	03	56		32	20	
Fayal, Villa de Horta	38	32		28	30	
Porto Sancto	32	58		16	22	
Madeira, Fonchal	32	33		17	8	
Palma, middle	28	36		17	57	
Ferro Iſle, South End	27	42	North Latitude	18	6	Weſt Longitude
Bonaviſta, N. End	16	14				
Terceira	39	14		27	22	
St. George	38	47		28	42	
Mayo, South End	15	11		23	7	
St. Jago, Port Praya	14	54		23	26	
Kamptſchatka Nos *Per Krinſhonicicoff*	56	10		198	36	
Drake Point, California	38	45		128	35	

If the Longitude be reckoned Eaſtward and exceeds 180, ſubtract it from 360, the Remainder is the Longitude Weſt, and vice verſa.

F I N I S.






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